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Gas and Its Competitors as an Industrial Fuel

Capitalizing the Various Advantages of Gas Over Other Industrial Fuels and Bringing These Advantages Before the Prospective Customer in Such a Way That He, as a Business Man, Can Appreciate and Take Hold of Them in Terms of Dollars and Cents

By THOMSON KING
Superintendent Fuel Sales, Consolidated Gas, Electric Light and Power Company of Baltimore

In the sale of gas and electricity for illumination we meet with little competition from other illuminants, because it is generally accepted as an established fact that they are superior to all other sources of light.

The Problem to Be Solved

This statement will also apply in varying degree to all domestic applications of these commodities. The electric fan has no competitor worthy of the name; the gas range is conceded to be in many ways superior to the coal stove, because in the home cleanliness and convenience are primary advantages. Therefore, to bring about the use of gas and electricity the problem is to create and so stimulate a desire in the mind of the prospective consumer for their acknowledged benefits and advantages that he will consent to the expenditure necessary to install and operate gas and electric appliances.

In the industrial field, however, conditions are somewhat different; we immediately feel the competition of gas and electricity generated in isolated plants, also that of many other sources of heat and power.

What Can Be Done with Other Fuels

The sale of gas for industrial purposes involves competition with coal, coke, wood, charcoal, gasoline, fuel oil, steam from isolated and central heating plants, and producer gas; and in industrial work it is usually not enough to prove that gas is cleaner and more convenient than its rivals, but we must prove that it is cheaper in dollars and cents, and unless we are able to convincingly capitalize cleanliness and convenience they will avail us little in the majority of cases. It is therefore important that he who would sell gas for industrial processes should know not only what can be done with gas but what can and cannot be done with other fuels.

The following table shows the relative cost of the most widely used fuels when considered on a basis of the heat units they contain and at the prices per unit of fuel. These unit prices, however, are at present subject to considerable fluctuation, so that in using the table it should be corrected, if necessary, for current prices.

It is immediately apparent from an inspection of these values that gas is very expensive if we regard only the heat content of fuels. However, we must

COST OF 100,000 B.T.U. AS CONTAINED IN VARIOUS FUELS

Fuel	Heat Content	Price	Cost per 100,000 B.t.u.
Soft coal	13,000 B.t.u. per pound	$5.50 per ton	$0.018
Hard coal	11,500 B.t.u. per pound	11.00 per ton	0.0436
Coke	12,000 B.t.u. per pound	11.00 per ton	0.041
Charcoal	13,000 B.t.u. per pound	0.20 per bushel	0.102
Wood	6,500 B.t.u. per pound	12.00 per cord	0.0576
Crude oil	19,500 B.t.u. per pound	0.09 per gallon	0.06
Gasoline	20,000 B.t.u. per pound	0.20 per gallon	0.197
Natural gas	1,000 B.t.u. per cubic foot	.0.25 per 1,000 cu. ft.	0.025
Producer gas	140 B.t.u. per cubic foot		0.025 Large producer unscrubbed gas
Steam	1,000 B.t.u. per pound	0.60 per 1,000 lb.	0.06
Electricity	3,412 B.t.u. per kilowatt-hour	0.03 per kilowatt-hour	0.879
City gas	600 B.t.u. per cubic foot	0.80 per 1,000 cu. ft	0.133

remember that although when a manufacturer purchases fuel he is apparently buying heat units, he is in reality buying results secured through the application of heat. Therefore, the only proper way to arrive at the relative costs of fuels is to compare them in terms of the results they produce expressed in terms of factory output.

Must Convince Him that Gas Is Cheapest

Keeping this fact in mind, it is apparent that to secure the adoption of gas in any factory we should make a thorough study of entire processes, consider every element of cost and every way of applying gas more effectively than other fuels. Having done this, we must then convince the prospective customer that, all things considered, gas is his cheapest fuel.

The first requires the engineer, the second the salesman; the ideal industrial solicitor should possess high technical ability, coupled with the convincing personality of the salesman.

Extreme Efficiency of Operation Not Enough

We will soon find that in large applications of heat, where gas meets the most difficult competition, extreme efficiency of application is not enough. A reference to our table will show that with city gas at 80 cents its efficiency must be more than seven times that of soft coal, three times that of coke and double that of wood in order that the cost of the applied heat be the same. In other words, assuming a gas efficiency of 80 per cent, which can seldom be exceeded in any process, we would have to assume an efficiency for soft coal, coke and wood of eleven, twenty-five and thirty-five respectively in order to meet their cost for effective heat. It is very evident that we must go farther than the efficient burning of our gas in order to secure industrial processes now being carried on with other fuels.

It behooves the industrial engineer to make a selective survey and study of all heat processes, searching each one for conditions that will be favorable to the application of gas and devising ways and means of utilizing its advantages to the fullest extent. To this end it is imperative that he know the relative value of the various advantages of gas and other fuels in order that he may be wise in his selection of those processes where it can make good his claims, and that time and energy may not be lost in fruitless attempts to apply it to processes for which it is not truly qualified and that its prestige be not dimmed by disappointments and failures.

Let us briefly survey the advantages we may claim for gas so that they may guide us in our search for these processes to which we may hope to prove a clear title and take over by right of fitness. We may conveniently group these advantages under five heads:

1. Flexibility of application and ease of control.
2. Efficiency of application.
3. Cleanliness.
4. Adaptability to intermittent application.
5. Elimination of storage problems and reduction of fire hazard.

Considering these advantages in the order named, which is also about the order of their relative importance, it appears that in flexibility and control of temperature gas far excels its competitors, with the exception of electricity. But we may be met with the statement that these advantages are possessed in like degree by producer gas. We believe, however, that an investigation of most producer plants will show that this is not true in practice and that the gas they supply is subject to wide variations in quality, which make control, especially automatic control, much more difficult than with clean city gas of practically constant characteristics, while the high cost of supplying producer gas when the use is small detracts very seriously from its claims to flexibility. In this connection it might be stated that the gas engineer should collect all the data possible on the operating costs of producer plants and make an especial study of their weak points and limitations.

The control of the quality of the furnace atmosphere is a question which has never received the attention from most gas men that its importance deserves. In many processes, especially those involving the heat treatment of metals, the excellence of the results obtained depend very largely upon the ability to accurately control the furnace atmosphere—it may be desirable to have it oxidizing, neutral or reducing. When gas is the fuel used and it is burned with the correct equipment, we can accurately control the atmosphere in the furnace and obtain results impossible with fuel oil or solid fuels. In some cases the value to the customer of this feature if properly capitalized may be as great as the cost of the gas used in the process, and we can show that it would be cheaper for him to use gas even if the other fuel could be had for nothing.

Automatic Temperature Control

The question of the application of automatic temperature control to processes is also one of great importance and at the same time considerable difficulty. We must see that we make the most of it and, by eliminating labor costs and increasing or improving production, overcome the cheapness of competing fuels. We must, however, always exercise very wise and careful discrimination in the selection and application of automatic devices, for if such devices are not wisely chosen and applied they will do far more harm than good and probably cause dissatisfaction with otherwise good appliances.

Tendency to Sacrifice Efficiency to Low First Cost

Passing to our second advantage, "efficiency of application," we find a wide field for truly scientific investigations, for co-operation with the manufacturer, looking toward the improvement of appliances, and for education of the consumer to secure appreciation of the advantages of gas as an industrial fuel and its efficient application. We must select the very best appliances for each particular process, and we must see that they are properly installed. Nor can we rest here; we must see that they remain in adjustment so that they may preserve their efficiency and usefulness. This introduces the question of free inspection for those customers who have no one in their employ who is capable of properly maintaining the adjustment of appliances. This is undoubtedly

necessary in many cases, but a full discussion of the subject would be too lengthy to be taken up here.

In connection with the selection of appliances it may be well to call attention to a condition the industrial gas salesman will surely encounter and must as surely overcome if he would attain more than temporary success. I refer to the tendency of the consumer to sacrifice efficiency to low first cost when buying appliances. This danger must be best illustrated by a concrete example.

A small candy manufacturer is about to purchase a gas furnace. He finds he can secure a cheap device with atmospheric burners for $20, while for $100 he can obtain one of better design with blast burners and a motor-driven blower. With the first his fuel cost for candy made will be 0.2 cent per pound and it will require thirty minutes to cook a batch, while with the more expensive equipment his fuel cost will be 0.15 cent per pound and he will be able to cook his batches in twenty-two minutes.

This man, unless very strongly advised, will probably buy the cheaper equipment, with the following results:

Suppose he averages ten 50-lb. batches on his furnace per day.

During a year he will cook about 150,000 lb. of candy.

His fuel cost with the $20 furnace will be $300; with the $100 equipment it will be $225. The money invested in the higher cost of the more efficient appliance will have earned nearly 100 per cent, besides reducing his operating time 400 hours in the year.

Furthermore, there is a big probability that through using the cheap furnace our customer may become dissatisfied with the high cost and slow work and turn over to coke or coal, a process that rightfully belongs to gas if only it is properly applied.

Importance of Flue-Gas Analysis

The industrial engineer needs definite and comprehensive knowledge on which to base advice to his customers, and firmness and resolution to enforce advice when given.

Careful tests of appliances, both in the laboratory and in service, are of vital importance and will surely pay for themselves by considerably broadening the field of gas application. In this connection it is proper to emphasize the importance of flue-gas analysis as an aid to efficiency. We believe that this test has not received the attention its usefulness deserves. It is only in comparatively recent times that it has been widely adopted in connection with the combustion of coal under the boilers of power plants, but now the CO_2 recorder is becoming almost as well known as the engine indicator. Its application to the products of combustion of the gas burner is neither difficult nor expensive, while the information it yields in conjunction with observation of flue temperatures is often definite and illuminating.

In our third advantage of cleanliness we find another quality in which gas is equalled only by electricity, and we also will find our customers ready to admit that this is worth something; but the question is, "How much?"

In some processes this quality is of paramount importance; in all processes it applies with more or less force. It may be that the quality of the product is being impaired by dirt; perhaps the health of employees is being injured. It should be the study of the salesman in each case to first arrive at a clear understanding of the benefits cleaner conditions will confer on his prospective customer, and then to present these benefits in so forceful and attractive a manner that he will create in him a desire to see his factory made clean, sanitary and modern by the use of a cleanly fuel. Investigation will show that recognition of the value of clean and sanitary conditions is on the increase, and it will constantly assume larger and larger proportions.

Adaptability to Intermittent Work

The adaptability of gas to intermittent work is in the broadest sense part of its flexibility, but is so important in many cases as to justify a separate heading. Its manifold advantages in this respect are so apparent that it is unnecessary to enlarge upon them here. It will suffice to say that if we could bring home to the average business man this and other advantages of our commodity we must strive to reduce them from the intangible to the concrete; we must resist the temptation to deal in generalities and make him see our claims in dollars and cents. We must show him just how much time his men are losing while they are waiting for a coal forge or an oil furnace to get up to the proper heat, and how much money he can save by putting in a gas furnace that can be put into service quickly and is always ready for action.

The prevalence of disastrous fires in this country, with their consequent enormous burden of economic loss, should make the American manufacturer very ready to welcome any change that will tend to reduce his fire hazard. That this is accomplished by the substitution of gas for other fuels is in many cases recognized by substantial reductions in insurance rates.

It is the manifest duty of the industrial gas engineer to see that all gas appliances are so installed as to eliminate all possible fire risk, and that no dangerous conditions are allowed to creep into existing installations. We must see to it that we establish and maintain for gas the reputation of a safe fuel.

Conclusion

In the foregoing notes we have endeavored to very briefly touch on some of the most important factors affecting the sale of gas by public service corporations as an industrial fuel. We have pointed out that in its larger applications conditions were essentially competitive. We have further shown that when the comparative cost of what we may call the heat content of fuels was considered gas cannot establish a clear title to any process unless one or more of the advantages of application which it possesses over other fuels applies to the process in question, or unless the heat from other fuels is being applied in a very inefficient manner. We have sought to indicate the most important aspects of the advantages of gas as they affect its application to industry and its relation to competing fuels.

In conclusion let us state that there are, beyond the shadow of a doubt, many industrial processes which cannot attain to the most perfect results or

the truest economy until gas is applied, and that today we cannot discern the limit to which we may extend the use of industrial gas in the communities we serve; but it is only through a clear realization and a careful and scientific study of the conditions and relations which we have so briefly considered in this paper that the industrial gas engineer can attain to his maximum usefulness and most worthily serve the company that employs him.

Efficiency One Thing—The Employment of Intelligence in Order to Accomplish a Result by Other Means a Very Different Matter

Dr. Lightner Witmer Declares that Success Comes Not Alone to the Efficient—Cites the Example of Hippomenes and Atalanta and of the Hare and the Tortoise

Efficiency exists only when the result is accomplished with a minimum expenditure of time and effort, and this relation is quantitatively measured.

The attainment of *efficiency* is only *one* way of achieving success, declared Dr. Lightner Witmer at a recent luncheon address at the Engineers' Club of Philadelphia. Another way of achieving success is through the exercise of intelligence. I use the word *intelligence* to mean invention—to employ the imagination to solve a new problem. In its highest manifestation it is what we call *genius* In the lowest manifestation it is what we call *cunning*. It is possessed by the young as well as by the old, and by the lower animals as well as by man—the ability to solve some problem which confronts him for the first time.

We are confronted all the time with performances in these days where we must distinguish the relative efficiency of individuals or institutions from their relative intelligence. It has been, to my mind, a conspicuous result of the achievements of this war that the Germans, despite their greater efficiency in industrial and military organization, have been beaten by the superior *intelligence* of the allied peoples. To my mind it does not help us in analyzing the situation to say that because the Allies have won the victory it therefore means greater efficiency. When, for example, Hippomenes and Atalanta were running their very famous race and Atalanta stopped to pick up the golden apples, it did not prove that Hippomenes was the more efficient runner, but that he had a higher intelligence than Atalanta. And so with another famous race—that of the hare and the tortoise. When the tortoise won the race because the hare went to sleep, the tortoise did not prove that he was the more efficient runner, but that he stuck to his job, the hare trusting too much to his superior ability.

Efficiency, Intelligence, Knowledge

Now, looking at what is involved, not only in the handling of men but in the handling of students, in the arrangement of the course or curriculum of a professional school, or in any institution where the different factors come into play, *efficiency is to be acquired only as the result of discipline through constant training and practice. It comes out of a repeated performance done over and over again until the maximum amount of output is obtained with a minimum amount of effort.* We do not like efficiency really, because it exists in an atmosphere of monotony and requires us to put forth strenuous effort. We like our *employees* to be efficient, our *students* to be efficient; but as for ourselves, we prefer to be *intelligent*. That is to say, we prefer to achieve success by some other means.

Success is not achieved solely through efficiency. Because American business men and American professional men achieve success and acquire wealth or obtain reputation is no proof that they are efficient. Efficiency is one thing; the employment of intelligence in order to accomplish a result by some other means is a very different matter. Those are two distinct aspects of every performance and they stand with respect to each other as though they were at quite opposite and contrasting poles. There is nothing so different from efficiency as this mental quality which I call intelligence.

Knowledge and Intellect

Knowledge, we are told, is power. Knowledge is acquired by the exercise of the memory; which means, again, either the training of the memory and the acquisition of ideas at some relatively low level, because lower types of men can achieve it, and the employment of knowledge is therefore for the purpose of producing *efficiency*, or it means the acquisition of knowledge in order to get new *ideas*. For example, the new discoveries with respect to by-products and the introduction of by-products in the manufacturing industries, it seems to me, do not add to efficiency. It is the introduction of a new bit of knowledge by virtue of which a new line of performance is carried on.

Now, we advance constantly; we make our successes through acquiring new knowledge, and it is therefore of great importance that we should consider what kind of knowledge is to be acquired and what its results and consequences are.

There is a certain kind of knowledge which we call professional knowledge — professional skill — which comes fairly close to efficiency, but which, in its higher regions of intellectual thought, does not involve efficiency at all, but processes that had better be called *imagination*, which brings it a little closer to this other capability which I call *intelligence*. A man's knowledge may be professional knowledge and lead him to success in your line or my line of work; or, on the other hand, his knowledge may be of human character. A man may succeed as an engineer or as a doctor—not because he is a good engineer or a good doctor *per se*, but because he understands human nature or can pass a good bluff, or because he has a lot of good friends.

Knowledge for Its Own Sake

There is one kind of knowledge which I, as a university man, feel is extremely important; that is, knowledge for its own sake—the possession of a certain amount of knowledge for the sake of acquiring new knowledge—knowledge which forms a basis for further investigation. In my opinion the great advances of the world have come, to a certain extent, through men of genius, men of intelligence, who have employed in specific sciences such knowledge as they were able to acquire in order to gain new knowledge. Other persons may subsequently have carried their results to a conclusion. For example, the aeroplane was invented by an American—Professor Langley—who barely achieved

(Continued on page 127.)

The Gas Appliance Testing Laboratory—Part XI

Gas Appliance Field so Fruitful as to Compel Original Investigation and Research on Part of Laboratory Man — Testing Flexible Tubing — Washers — Matches — Appliances That Do Not Reveal Their Worthlessness at First Try

By H. M. RILEY and L. B. WILSON, Jr.

From time to time the Laboratory is called upon to test many gas consuming devices, as well as apparatus intended to be used in conjunction with gas appliances, which, in some instances, are "fearfully and wonderfully made," and although a large portion of these do not measure up to the requirements, yet they definitely indicate that the gas appliance field is a fruitful one and is rightly compelling original investigation and research along this line. And let it be said that the amount of ingenuity necessary to be displayed by the testing man in order to give such appliances a rating is, unfortunately, generally inversely proportional to their final utility. In other words, then, when one encounters a very complicated device, which, in the end, is found to be of little or no value to the customer, he will most generally have to perform not a few mental gymnastics in order to devise an equitable scheme for testing the object at hand. Of course there are many of such contraptions, the lack of usefulness of which is at once obviously apparent and hence can be disposed of verbally, so to speak, but on the other hand the writers have personally had to contend with the testing of quite a few whose worthlessness did not put in an appearance until the very end. In short, this aspect of the Laboratory work is probably the most exacting of all its activities, but at the same time, undoubtedly, the most interesting. Among the contrivances referred to might be mentioned safety devices which are grossly misnamed, various automatic gas shut-offs and alarms, complicated thermostats, which do not work, burners with an efficiency claimed to be over 90 per cent and what not. It not being the intention of this article to deal exhaustively with the above, the reader is referred to an article appearing in June 16, 1917, issue of the AMERICAN GAS ENGINEERING JOURNAL, particularly to pages 583, 584 and 585 for more detailed information concerning the same.

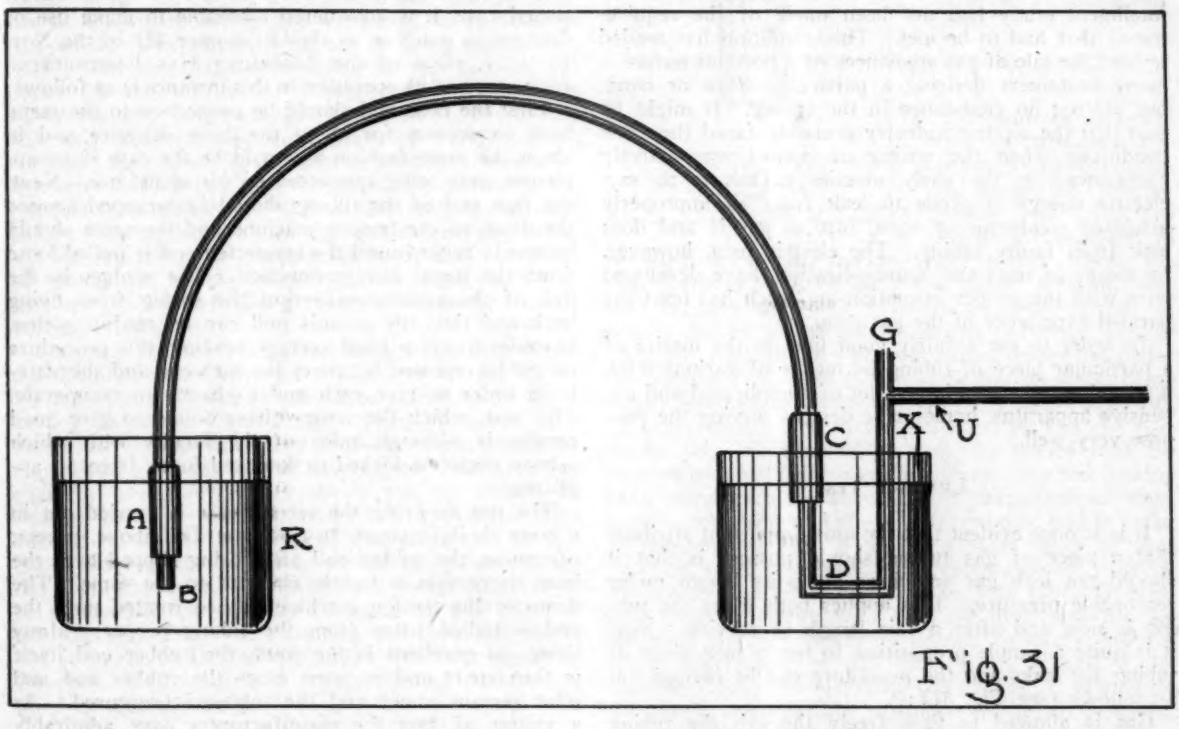

Fig. 31

Another phase of the work usually handled by the Appliance Laboratory is concerned with the development of various burners to meet unusual conditions in practice and also perfecting various appliances by means of changes in their design. (Also see June 16, 1917, issue of this publication.)

Obviously, this class of testing might be designated as research work.

Lastly, some laboratories handles such work as the testing of certain materials and objects which are used by the fitters and mechanics in the installation of appliances. Indeed in the case of several, many materials such as paint, jute, solder, soap, towels, leather and other sundry materials are also handled by the Appli-

ance Testing Laboratory. We might now proceed with the description of several tests of a miscellaneous nature.

Gas Tubing

Quite a good deal of excellent work has been done in the past year or so towards developing gas tubing that is reliable and generally satisfactory. This work, of course, necessitated considerable testing of a varied nature and has been carried out quite painstakingly, particularly by the Bureau of Standards. We can therefore feel assured that concise and accurate information concerning the method of procedure for testing tubing should be readily available in the near future.

It must be said that some manufacturers of gas tubing have, in the past, turned out a product which did not hold up at all in practice, simply because an intelligent study had not been made of the requirements that had to be met. This condition has tended to hurt the sale of gas appliances of a portable nature—many customers desiring a particular stove or lamp, but placing no confidence in the tubing. It might be said that the electric industry probably faced the same conditions when the wiring of houses was actively commenced in the early nineties. That is to say, electric energy is prone to leak from an improperly insulated conductor or wire, just as gas is and does leak from faulty tubing. The electric men, however, by means of tests and standardization, have developed wire with the proper insulation and such has been the parallel experience of the gas men.

In order to get a fairly good line on the merits of a particular piece of tubing by means of various tests, it is not necessary to have a lot of complicated and expensive apparatus, home-made devices serving the purpose very well.

Leakage Test

It is at once evident that the most important attribute that a piece of gas tubing should possess is that it should not leak gas anywhere along its length under reasonable pressure. This applies both when the tubing is new and after a fair length of service. Now it is quite a simple proposition to test a new piece of tubing for leaks and the procedure can be carried out as follows (see Fig. 31):

Gas is allowed to flow freely through the tubing for a minute or so, the supply being preferably from a small holder or prover, after which the end "A" is slipped over a hose connection "B" which has been previously plugged with sealing wax or other similar material. A portion of the end is then immersed in a receptacle "R" containing water. Next, end "C" is slipped over one end of piping "D" which can be made of small bore brass tubing. (At "X" another horizontal piece of metal piping is joined to pipe "D" by means of brazing. "U" indicates an U-tube. At "G" is provided a recording or other style of gauge.) Next, end "C" is partly immersed in water and the gas pressure is applied from the small sample holder. When the proper degree of pressure is attained, as shown by gauge "G," the cock is closed. The purpose of immersing ends "A" and "C" in water is to render easy detection of any gas leaking from the ends where they pass over "B" and "D." At regular intervals the gauge reading can be noted and conclusions drawn therefrom. In case one desires to ascertain the amount of leakage in cubic feet per hour, a small accurate wet meter can be interposed between the gauge and the sample holder, care of course being taken that none of the connecting joints leak.

Testing Tubing Ends

The rubber ends of tubing might be faulty in one or more of the following ways:

1st. Their inner side might be of such a nature that but very little force or pull would be required to disengage them from the metal hose connections.

2d. They might be very insecurely glued or fastened to the tubing proper.

3d. They might show undue or premature wearing out—that is, they might split or wear large too quickly.

In order to apply a test to take care of the first mentioned case, it is considered advisable to make use of the tension machine as shown on page 427 of the Nov. 10, 1917, issue of the American Gas Engineering Journal, and its operation in this instance is as follows:

First the hose end should be pushed on to the metal hose connection for about the same distance and in about the same fashion as would be the case if an appliance were being connected up for actual use. Next, the free end of the tubing should be wrapped around the drum of the tension machine and the same should be slowly turned until the connected end is pulled loose from the metal hose connection. The wedges in the link of the apparatus prevent the spring from flying back and thus the pounds pull can be readily gotten. In order to get a good average reading, this procedure should be repeated ten times for each end and alternately in order to give each end a chance to recuperate. This test, which the writers have found to give good results, is a rough index of the faculty with which a hose might be kicked or knocked loose from an appliance.

The test covering the second case is carried out in a quite similar manner to that described above, except, of course, the rubber end after being slipped over the hose connection is tightly clamped to the same. The drum of the tension machine is then rotated until the end is pulled loose from the tubing proper. Many times, so excellent is the joint, the rubber end itself is torn apart and in some cases the rubber end and joint remain intact and the tubing is ruptured. As a matter of fact the manufacturers have admirably taken care of this point, viz.: the making of a good connection of the rubber end to the tubing.

The third item can be taken care of in the following manner:

After first finding the pounds pull necessary to disengage the rubber end from the hose connection, it is pushed onto a conical piece of steel or mandril, slightly larger than the hose connection (see Fig. 32) and allowed to remain thus, say for 48 hours; then it is removed and again tested on the tension apparatus. After repeating this procedure for, say, six or seven times, enough data can be gotten to furnish an estimate of the value of this feature of the tubing's make-up. Of course, the pounds pull will decrease after each successive ageing on the mandril. This mandril can be graduated and it might be found preferable to push the end farther onto the same at the end of each 48 hours.

Leakage Test After Ageing

Oftentimes a customer upon starting up an appliance, say a heater, after the summer season, discovers that the gas tubing has acquired a more or less permanent set as regards curvature; that is, the tubing when put away for the summer was coiled up and placed on a shelf or most likely hung in an inverted U-shape over a hook or nail in the pantry, and being in this position for a long time and also subjected to the heat, assumed a permanent shape in its curved portion. At all events, an attempt to straighten out the tubing will most likely lead to a splitting or cracking of the inner layers of sufficient extent to cause leakage. This set or hard condition of the tubing's structure is no doubt due to the drying process caused by the heat. Of course the solution for this difficulty lies in not incorporating any ingredient in its makeup that would show rapid drying out or aging qualities.

It is obvious that the devising of any test to account for the liability of a piece of tubing to age fairly rapidly, would call for the same to be carried out in a comparatively short space of time, and accordingly the results could only be used in a comparative sense. That is to say, it would be practically impossible to tell how long this or that tubing will last before showing signs of leakage and failure otherwise, but we can tell on a comparative basis that one piece of tubing will outlast another, two to one, etc. One way in which a test along these lines can be carried out is as follows:

First test the new tubing for leakage and then if gas tight, coil the same around a diameter of say 12 or 14 inches, after which it should be placed in an oven, say of an ordinary gas range. Then by means of a thermometer, the temperature of the oven should be maintained at about 220 or 240 degrees Fahr. for say eight or nine hours, after which the gas should be shut off and the oven allowed to cool gradually. This heating up should be repeated for about five or six days, after which the tubing should be removed from the oven and tested for leaks. Or better still, it can be removed after each day's heating up and the leak test applied. Too violent heating will give bad results and it might be advisable to apply the heat gently at the start, not raising it to a maximum until about the third or fourth day.

Liability of Tubing to Kink

Oftentimes a piece of tubing, when connecting an appliance to a hose cock fairly high up on the wall or on a lighting fixture, will become twisted or looped, which condition will tend to form a kink or cause the tubing to collapse, giving rise to leaks. Naturally, some pieces of tubing are more prone to kink than others and the degree of liability can be estimated by tying an ordinary knot in a given piece and pulling it on the tension machine until little or no gas passes through the tubing when removed and connected to a small gas-filled prover. The relation or comparison between two pieces of tubing would be shown by the pounds pull and the small amount of gas passing through the tubing when connected to a supply line.

Other simple miscellaneous tests on gas tubing can be made along the line of noting the effect of moisture on the tubing proper and also on the dye of the outer covering—this latter item is important, particularly if one has ever had any connection with the complaint department and thereby had the opportunity to see first hand the effect of inferior dye on table covers, etc. It is also advisable to ascertain the amount of gas that can be passed through the tubing for a given drop in pressure.

Lastly, it is well to completely dissect the tubing and record the nature of its constituent parts.

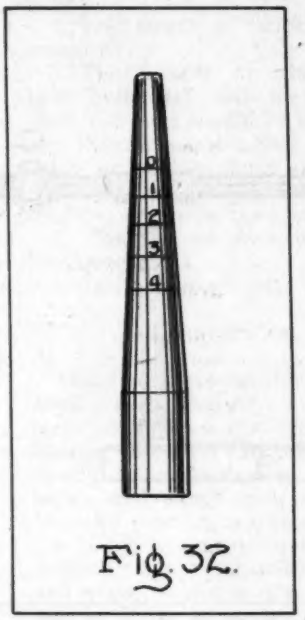

Fig. 32.

Washers

Oftentimes the fitting or appliance department might desire to know the relative merits of different kinds of washers to be used in unions and in other places where fitting work is to be done. We know, offhand, that lead washers will tend to mash or grow thinner in places due to vibrations or shocks, whereas, leather ones will gradually dry out and shrink somewhat under the influence of heat. Also, asbestos washers, being rather inclined to friability, will most likely flake off. In other words, due to certain alterations in the particular washer's physical makeup, the tendency of the joint to leak will grow more imminent. Any test looking to a search into the above-named characteristics must employ both heat and shock or vibrations, and in order to consummate such a test in a short space of time the heat must be applied with comparatively high intensity and the vibrations must be both fairly frequent and greatly accentuated. Fig. 33 illustrates the assembling of the apparatus needed to carry out the work. Referring to this illustration, A and B are wooden blocks for mounting the fittings; C is a union wherein is contained the particular washer to be tested; D is a piece of pipe say 6 or 7 feet in length; E is a tee sufficiently large for D to pass through the same with a fair degree of play; F is a cap and G an opening to which gas from a meter can be supplied. The test proper might be divided into two parts—1st, the tightening of the union to the proper degree, and 2d, the respective vibrating and heating of the long pipe D and the union.

In the first part the union is tightened by means of a fairly long wrench on the end of which is attached a spring scale of sufficient capacity having a hand grip substituted for the usual hook or ring. The wrench is used without the scales for tightening the union at the start, after which the scale is attached and the final pull accomplished by means of the hand grip. When using the scale, care is taken to always pull as nearly at right angles to the wrench handle as possible. When tightened to the proper predetermined degree, the pounds pull is recorded, after which gas pressure is applied and the meter watched for leakage. If there

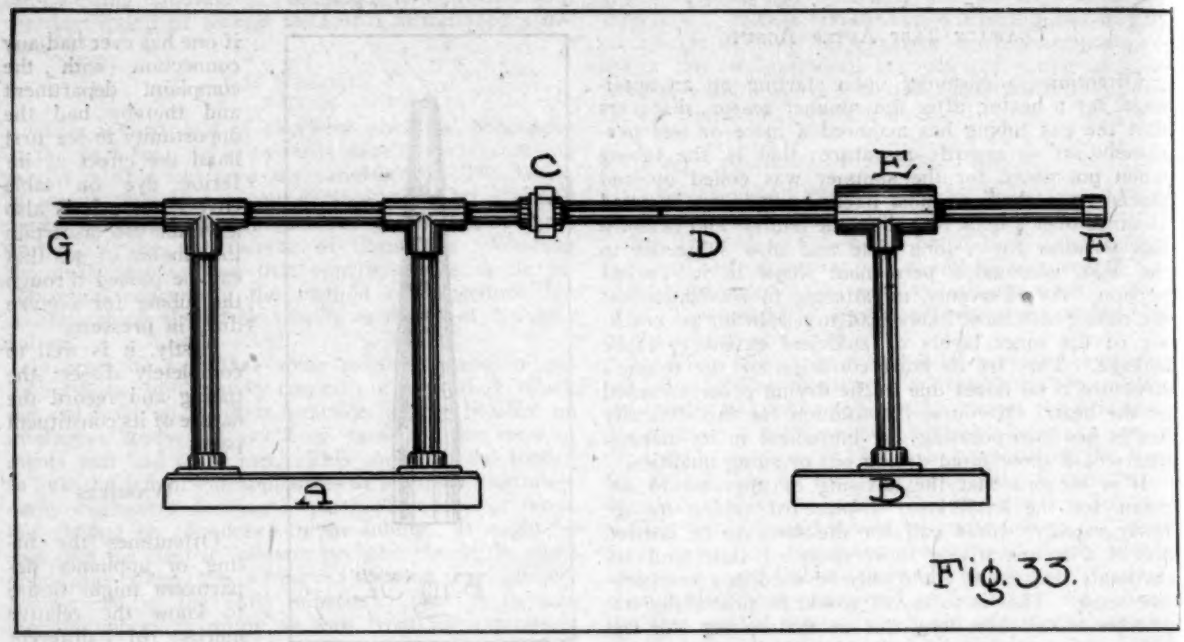

Fig. 33.

are any leaks they should be searched out, and if in the union it should be further tightened.

In the second part of the test, the end of the long pipe D is grasped in the hand and vibrated back and forth at a fairly uniform rate, the vibrations being counted.

Depending on the nature of the washer, heat can also be supplied during the period of vibration by means of a bunsen burner. If the washer is of leather or paper or other similar material, the union should be heated, but if of lead or other metal it is not considered necessary to do so.

After each hundred vibrations, say, the gas pressure should again be supplied and any leakage noted by means of the meter. Or still another way to rate the washer would be to measure the angular displacement of the wrench necessary to tighten the union again to the original degree. For example, the union might have been originally made tight with a 95 lbs. pull and after a hundred vibrations it might take a quarter of a turn or 90 degrees displacement necessary to cause a pull on the wrench of 95 lbs.

Where leather or other similar washers are being tested, they might be examined before and after being subjected to the ageing described above. Incidentally, this test has given very satisfactory results in the Baltimore Company's Laboratory.

Matches

Inasmuch as matches are used quite frequently by the fitters and others in a gas company, it is considered quite proper that they should be tested for any defects or good qualities, and in this connection we might say that this simple article's good performance in service depends on a number of qualities. Among these we will enumerate

1st. Strength of stick—We are all very familiar with matches having weak sticks, particularly those which we have been "burdened" with during the war, and the objection to such is apparent.

2d. Likelihood of heads to fly when the matches are struck. This feature, too, is quite commonly known and its effects when present are more or less dangerous.

3d. Liability of heads to glow and fall off after match has gone out. This phase also presents a fire hazard.

Strength of Stick

The stress that a match stick is under when being scratched is virtually the same as in the case of a uniform beam supported near or at the ends and loaded in the middle. The box or scratched object serves as one support, the thumb and index finger is the other

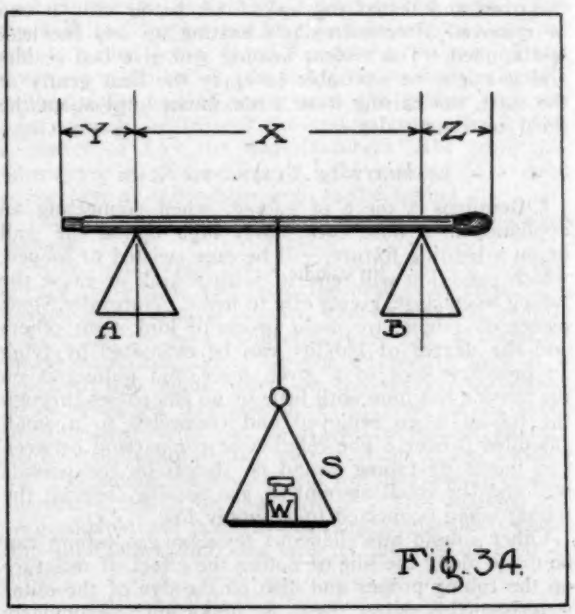

Fig. 34.

support and the pressure supplied by the forefinger acts as the bending load. This conception readily enables one to rig up a simple apparatus for carrying out an accurate test for the characteristics under consideration. Figure 34 depicts the method and contrivance for the work at hand. A and B are two supports and can be of three-cornered iron; S is a scale pan suspended from the middle of the match; and W represents the weights to be supplied to cause failure of the match. The distances Y and Z should be about 3/8 of an inch, but the distance X does not necessarily have to be constant for different matches, since the distance covered by the thumb and forefinger will be essentially the same no matter how long the match is. It is felt that the above few lines entirely describes the testing routine. In passing, we might again mention that the readers are well aware of the fact that foreign or "war quality" matches are miserable failures in so far as the strength of the stick is concerned.

Fifteen or twenty matches selected at random from one or more boxes should be sufficient to furnish a good average figure giving the index of the stick's strength.

Tendency of Heads to Fly

This item can be taken care of by selecting about twenty matches from each of five boxes and striking them one after another and noting any heads that fly. The writers have run across certain brands of matches which showed a decided tendency for the heads to fly and this is no doubt due to the free burning or explosive tendency of the head, and probably shows laxity in proportioning the ingredients which go into the making of the head.

One should not confuse the emission of a few bright sparks with the flying off of burning particles.

Liability of Heads to Glow

The phenomenon of a match head glowing or slowly burning after the flame proper has gone out is undoubtedly due to carbon or some other combustible ingredient in the head oxidizing very slowly but nevertheless surely. It is hardly a matter of incandescence as in the case of a gas mantle, because some matches' heads will glow comparatively brightly after the flame has entirely receded from this portion of the stick. It might be surprising, but there are certain matches on the market whose heads will persist in glowing or burning for a minute or more and indeed after the flame has completely consumed the stick. It is quite evident that this is a dangerous feature and liable to cause fire. The test might be handled as follows: Select say forty or fifty matches from several boxes and strike each one at a time. Then just after the flame has left the head in its travel along the stick, record the time the head is aglow by means of a stop watch. Another suggestion that might be worked out would be to sever the head and drop it into a small tube of oil to note whether any ignition takes place.

Miscellaneous Data on Matches

Besides the above-mentioned tests on matches, there are certain other pieces of information which should be obtained, among which we will briefly mention—

1. The number of matches in a box should be determined.
2. The length of stick and thickness should be measured.
3. The manner in which the stick burns when held horizontal and the time to completely consume the same should be recorded. This refers to the fact that some match sticks burn very slowly and with a low or subdued flame and vice versa. When burning the entire stick, it should be held by means of a long pin or needle stuck in the end.
4. Tendency of stick to ignite readily after head has been struck.
5. Ignition temperature of the head.

Tendency of Head to Ignite

There are some matches whose heads will not ignite readily when the same are struck for the first time, merely emitting a few sparks or else burning without igniting the stick. In this case one hundred matches should be selected, say twenty from each of five boxes, and struck with about the same intensity as in actual practice, a record being taken of the number which fail to ignite the stick. Sometimes this failure might amount to as much as ten or fifteen per cent and might be due to the matches being damp or else inferior in make.

Ignition Temperature of the Head

The temperature at which the head of a particular brand of matches will ignite, or in other words, the kindling temperature, may be quite accurately ascertained by means of a simple home-made apparatus. Take an ordinary sized tin can, say one such as Pentane comes in, and bore or punch two round holes in the top and a large square one in the side. One of these "A" should be so fitted as to carry a thermometer "T" and the other, "B," is to be used for inserting a match "M." "W" is a piece of wire for supporting the match, "G" is a mica window. A set of small holes should also be punched around the side near the bottom.

Now the test is carried out by fastening a match on one end of the wire and suspending it into the can after which the thermometer is inserted with its bulb in close proximity to the head of the match. Next, heat is slowly applied to the bottom of the can by means of a bunsen burner and the match and thermometer are watched until the moment the head ignites, whereupon the temperature is read. Of course, just at the time of ignition the mercury rises very rapidly and hence one should be careful and catch the temperature just at the proper time. Twenty-five or thirty matches should be tested in this manner, and in this connection it is remarkable how close they will check up in the case of a well-made article.

Heroic British Measures to Meet Fuel Problems

Details of the heroic measures taken by the British Government to meet fuel problems vital to the winning of the war are presented at length in a memorandum supplemental to the general report of the commission sent abroad by United States Fuel Administrator Harry A. Garfield.

Where the United States was able to increase its coal production, Great Britain, during the five years of the war, suffered a loss of approximately 185,000,000 tons mined, using the 1913 production figures as a basis for computation.

The steps taken to meet the situation included: Government control of mines; restriction of export, which suffered to the extent of 160,000,000 tons of the 185,000,000 mentioned; the rationing of households, designed to conserve eight million of the forty million tons normally consumed annually for domestic purposes; and "zoning" consumers to the mines nearest them, through which the railroads were able to take up the burden added by loss of shipping from submarines.

Something of the magnitude of the disorganization wrought in the Britsh coal trade by the advent of the war may be realized by a glance at the statistics dealing with the rush of mine workers to the colors when the war began.

In the first year of the war 191,170 miners enlisted and in June, 1916, the total had risen to 285,000. On the latter date the net loss of mine labor had been reduced to 133,000 men through extraordinary efforts to return soldiers to the mines, but this latter program was interrupted early in 1918 by the necessity of returning 75,000 miners to the battle lines.

"Uneven distribution" is assigned in the report as the next gravest of the initial problems of the war.

The railroads had been brought under Government control at the beginning of the war, and the railway department of the Board of Trade simultaneously began supervision of the relief of local shortages. But as the result of experiences in the first winter of the war, a coal exports committee was appointed by the president of the Board of Trade in May, 1915, with power to increase domestic supply by restricting exports.

Distribution committees, the report continues, were set up in the second winter of the war, but it was not until July 4, 1917, that the zone system was installed by the coal transport order under the Defense of the Realm regulations. The report says that the goal set for the zoning operations, the saving of 700,000,000 ton-miles annually, seems to have been attained, and adds:

"It is asserted, moreover, that but for this saving the railroads would not have been able to meet the increased demands enforced upon their facilities by the submarine menace."

The rationing system has not been in operation a sufficient length of time, the commission found, to allow for an effective check on its results. Rationing was applied to the whole country only in the fall of 1918, though London was rationed in the winter of 1917. Where the French system is to ration coal upon a per-capita basis, the British allowance was computed upon the number of rooms occupied.

The report points out particularly how the exports restrictions, aside from keeping within the country the necessary quantities of coal for war operations, made coal "a very effective weapon in the conduct of the war, not only in assisting allies but in exacting favorable terms with neutrals, as well as securing much-needed materials, supplies and shipping."

The coal exports committee determined not only the amounts to be exported and the consignee, but the price of sale.

Taking up the subject of Government control, the report makes it clear that operation of the mines was left in the hands of the owners, and that their profits were reduced when their output fell below pre-war figures, although not in exact proportion.

The coal mines control agreement (confirmation) act passed by Parliament Feb. 8, 1918, embodied the substance of long negotiations between the mine owners and the coal controller, Mr. (later Sir) Guy Calthrop, who was general manager of the London & North-Western Railway when appointed in February, 1917.

Collieries were guaranteed a "standard" profit when their pre-war output was maintained, and a portion of their excess profits taxes went to the fund from which the coal controller paid his administration expenses and allowances to mines which failed to maintain their pre-war profits.

"For the purpose of compensation," the report says, "the controller takes as a standard the profit and the output in the pre-war period which was adopted for excess profits only under the finance act of 1915 (i. e., the average of the best two out of the three years before the war, or the best four out of six)."

Of excess profits earned, a colliery was allowed £200 plus 5 per cent. Eighty per cent of the remainder, according to the report, is collected by the inland revenue as excess profits duty and 15 per cent allocated to the coal controller's finances, known as the coal excess payments (fund).

No figures were available, says the report, but it was rumored that this fund gave promise of a considerable deficit.

Coupled with the inroads of the army upon the ranks of the miners, "excessive absenteeism" on the part of remaining miners is mentioned in the report as a chief contributing cause to the loss in production.

The assumption of Government control of all coal mines followed very shortly upon labor troubles in the South Wales field in 1916. On December 1 of that year the Government assumed control of those fields and on March 1 following Mr. Calthrop was given direction of all coal-mining operations, as well as of distribution, price and consumption of coal. An advisory board made up of representatives of mine owners and mine workers was appointed to assist him.

"Labor troubles have required constant and continuing attention," says the report, "and there is no little unrest at the present time. . . . The English authorities assert that they do not anticipate any serious difficulty, but the labor situation is, to say the least, uncertain."

Ottawa to Have Gas Plant with 350,000 Cu. Ft. Capacity Daily

Ottawa, Illinois, is to have a gas plant capable of producing 350,000 cu. ft. of gas daily, run only in the daytime. The 7-ft. 6-in. gas machine formerly in use at the old Evanston (Ill.) gas plant is now in course of removal to the gas station at Ottawa. Several weeks probably will be required to dismantle, transport and re-erect the elaborate apparatus. A 9-in. station meter necessitated by the sending out of gas is to be installed at Ottawa. The holder capacity is now 350,000 cu. ft.

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As the Journal Views It

Too Big a Responsibility to be Intrusted to a Fifteen-Dollar-a-Week Clerk

We were impressed with his apparently deep consideration for the small consumer. It seemed to us almost to approach the point of benevolence.

"You do not grasp the point," he intervened. "Of course, it is poor business for a public utility to wantonly slight or affront anyone. But the real reason why we insist upon entire courtesy to everyone who enters our premises is that we believe it is too great a responsibility—that of determining whether the man at the other side of the window is an obscure little nonentity or an influential force in the community—to be intrusted to a fifteen-dollar-a-week clerk."

The Vote Is Unanimous

For a long time the AMERICAN GAS ENGINEERING JOURNAL was convinced we were on the wrong track in our merchandising methods. It felt it to be its duty to point out and suggest remedies for the various defects that existed.

The difficulty was in getting writers intimately enough acquainted with the weaknesses that existed to make a complete record, and broad-visioned enough to point out new paths to be followed. After months of seeking such writers were found. By

fortunate coincidence the quest was to a sufficient extent completed at the moment when the gas industry was most ready to give ear to their suggestions.

The war was at an end. Merchandising had been discontinued entirely or carried along almost mechanically. There were no structures to be wrecked previous to building anew.

Considerable interest has been aroused by merchandising articles and comment thereon published in these pages in the past few months. In the final analysis the principal weakness in our merchandising structure was lack of plain speaking.

No one dared, apparently, to dispute the utterances of anyone else, fearing, perhaps, rebuttal that might be damaging to one's own prestige.

Some suggested very excellent systems of compensating salesmen, and made their thesis ridiculous by setting base rates so low in all cases that even under the best plan no salesman could hope to attain more than a bare living. Why? Perhaps because their own companies were getting by with starvation wages and the originators of the plan did not want to stir up anything.

Everyone knows there have been commercial managers in the gas field who were well equipped to preside at a ribbon counter, but utterly out of place handling so technical a product as gas appliances. But no one spoke these things. They whispered.

Those who have had the greatest opportunity of observing them were manufacturers' representatives. For one of these to give voice publicly to his opinion of this or that type's qualifications would be tantamount to closing the doors of various prospective markets to his principal's product.

There were other managers who could have accomplished something if they had not been overhampered with too much ignorant or selfish direction from overhead. Someone was needed to advise those on top, unless they be skilled merchandisers, to keep their hands off and leave to the specialist his specialized task.

The AMERICAN GAS ENGINEERING JOURNAL's articles pointed out a good many things that were wrong with our former merchandising organizations. It has by no means completed the task.

Lately we have noticed a considerable tendency on the part of gas-company merchandisers to let loose on their own account.

Even gas journals of the type that first make sure that no one is going to differ with them, then lay down sententious utterances, have taken up the cudgels and are belatedly and somewhat petulantly demanding to know "What's the matter with our merchandising methods?"

The ball apparently has been started rolling and gathers momentum as it goes. The time for some real work in our merchandising departments, some real ideas and some real innovations is long overdue. Hitherto we have at the best aped others, real merchandisers. There is no reason in the world why the gas industry should not so conduct its merchandising that real merchandisers will also ape it.

Great days are ahead of the industry in merchandising. The present tendency to acknowledge weaknesses and to forego dearly cherished notions to correct them cannot but bring these days immeasurably nearer at hand.

Something Concrete in the Way of Bettering the Lot of the Technical Worker

We, too, have served on the engineering forces of a great railroad. We sought employment there in quest of experience and a living. We got a great deal of the former, and, by dint of drastic economy, eked out the latter.

We have before us a standardized scale of compensation recommended for technical engineers on railroads by the American Association of Engineers. Our eyes light on the sum of one hundred dollars per month for a tapeman on permanent work. Our first thought is: Poor typesetting and worse proofreading. But no! Here we have rodman, one hundred and twenty-five dollars a month. And instrument-man at two hundred dollars a month.

Our starting wage as tapeman—they called it chainman then—was sixty dollars a month. The work was considered hazardous, or we would only have gotten forty-five. Our wages was sixty-six and six-tenths of that received by the lowest-paid laborer, with this advantage on the side of the latter: He worked eight hours a day. We never worked less than that, and quite frequently more.

As rodman we got ninety dollars. The job didn't last long enough for us to become instrument-man. If it had we would have gotten one hundred and twenty-five dollars a month.

But two hundred dollars a month for an instrument-man! Our eyes would like to pop out. What is the world coming to? Why, a single man or a man with a good manager for wife could live on that quite decently.

It is true that these are but recommendations. But the handwriting on the wall must be very evident indeed when an important technical association dares even to suggest such unheard-of figures.

When the railroad technical engineer attains such a standard of compensation the technical worker in the gas field should have attained relative opulence; for, lowly-waged though he has been, he has never been quite brought down to the plane of the technical worker in the railroading ranks.

Publications

Gas and Flame in Modern Warfare

By Major S. J. M. Auld, Royal Berkshire Regiment and member of the British Military Mission to the United States. Boards; 7¾ x 5¼ in.; 202 pages. Frontispiece by Lieut. W. G. Thayer. Price, $1.35 net. New York, 1918; George H. Doran Company.

Do any of our readers know what a divisional gas company is? There can be no doubt of it. Or a divisional gas office and its attendant divisional gas officer? The terms surely will have a familiar ring. Nevertheless, Major Auld introduces us to new varieties of these things in his fascinating and instructive work dealing with the theory and practice of Hunnish gas attacks, from the initial experiments with chlorine and chlorine-phosgene mixtures right up to the final and most advanced scientific attainments in the shape of tear and mustard gas enclosed in shells—together with the success of the Allies in offsetting and retaliating against these products of Kultur.

"What's this 'ere divisional gas officer, Bill?" asked a British "Tommie" newly arrived at the frant.

"Why, o's the bloke what goes 'round and blows up the obserwation balloons," responded his mate, proud of his superior acquaintance with matters military.

Those who would know exactly the functions of this vastly overworked and highly important factor in Allied defence may discover for themselves by a perusal of Major Auld's brochure. While its subject naturally bears little relation to the gas industry as we are wont to think of it, yet one may gain thereby much information which never appeared in the newspaper dispatches, and be highly entertained at the same time. It is well worth reading for its own sake, the more so because its revelations should be part of the mental equipment of every well-informed man, and we will venture the opinion that, once begun, the work will not be put down until the reader has satisfied himself as to the methods by which the Allies neutralized the effects of gas attacks.

From it one may learn which were the really dangerous gases and which were little feared, though apparently more formidable; how on several occasions the Germans succeeded in gassing themselves most effectively when the wind shifted, and the unholy glee thereat of their intended victims, the Royal Irish Rifles; how men who fancied themselves only slightly gassed with phosgene collapsed and died later on, sometimes as long as fourteen hours after the attack; how those who "faked" gassing in order to gain a few days' rest were detected when they accepted and enjoyed proffered cigarettes, how some "rookies" were ashamed to wear gas masks and the casualties which resulted; how the first gas attack, April 22, 1915, affected the Canadians, French and British; how gas masks were made for horses and mules—and the latter's method of showing their detestation for such unfamiliar contrivances, and most important of all, how the Allies' defensive devices kept pace with German progress in the art of slaying.

Without apparently attempting anything of the sort, the author gives us an atmosphere of trench life which is all the more vivid because unstudied. One can almost conjure up the emotions felt by troops undergoing a gas attack, and these are by no means the same as might be imagined. German savagery is well illustrated by the incident, plainly seen from the Allied trenches, when two miserable creatures, bearing *flamenwerfer*, or flame-throwers, on their backs, were forced over the top and out into No Man's Land in broad daylight at the point of a revolver. One was shot down instantly, while the other, in full view of the British, threw away his murderous device and began to crawl on hands and knees toward the latter's lines. He was suffered, through no fault of the Germans who tried to shoot him, to arrive in safety, and was taken care of.

One would scarcely look for humorous incidents in a work of this sort, but they are there in plenty. The efforts of two soldiers to get into the same gas mask; the men who thought the chest a proper place to wear their masks; the inability of sentries now and then to resist the temptation to have a lark by "setting off" the Strombos horn, which works by compressed air and sounds a gas attack alarm which gets everyone out of bed for a distance of eight miles back of the trenches, and the advice of a British sergeant to his squad to the effect that "If you don't look for the 'oles in yer 'elmet, they'll soon be lookin' for a 'ole for you" —all these and many more enliven the pages of this informing volume.

As Chief Gas Officer to Sir Julian Byng's army, Major Auld knew gas warfare from top to bottom. Chemist, veteran of two wars, wearer of the Military Cross, wounded in No Man's Land while crawling into enemy trenches to observe the effect of a British gas attack, he can be accounted at once an able soldier and the most competent anti-gas scientist at the disposal of the Allies.

His book, therefore, is the result of his experience with gas warfare—wise in its counsels and personal observations, and fascinating in its telling of the tale of German *schrechlichkeit* from its first terrifying appearance to its neutralization by the skill of Allied scientists.

"Acipco"

Prepared and published by the American Cast Iron Pipe Company. Paper; 9¼ x 6 in.; 72 pages; numerous illustrations from photographs. Obtainable from the American Cast Iron Pipe Company, Birmingham, Ala.

It is Henry Ford who is usually thought of first when the conversation turns to large-scale industrial welfare work, the improvement of the relationship between employer and employee, helping the workman to help himself, and matters of that sort. But if the charterer of the Oscar II has received, because of a picturesque character and a genius for getting into the limelight, more free advertising in connection with his progressive attitude toward labor than anyone else, yet he has by no means had the field to himself, nor has he enjoyed the monopoly in this excellent branch of endeavor which some suppose.

This is strikingly shown by the pamphlet with the slightly tongue-twisting title noted above. (The correct pronunciation, by the way, is A-sip-co, with the accent on the middle syllable.) As far back as 1911 the American Cast Iron Pipe Company, realizing that cleanliness is next to godliness, and that for

the average workman it is likewise next to impossible because of inadequate bathing facilities, "started out to do the obvious thing," as the book phrases it, by erecting a modern bathhouse at the works. This was equipped with showers, individual steel lockers and separate bathrooms and locker-rooms for the white and colored workmen, and its opening proved to be "an auspicious event in the development of Acipco."

For the popularity which it enjoyed and the obvious gain in morale and general efficiency produced by this innovation led company officials to plan a three-story building connecting with the bathhouse and containing a restaurant on the ground floor. The second floor was made a clubroom for the colored workmen and the third devoted to sleeping quarters for the colored men. The work of management was turned over to the industrial department of the local Y. M. C. A., with happy results.

Then followed at regular intervals the medical service, including a hospital; the dental service, an elaborate housing program and the organization of numerous clubs, athletic teams, and the promotion of a loyal community spirit. The underlying principle governing all steps taken toward the betterment of the employees may best be told by the writer of the pamphlet, who says: "Co-operation is the keynote. A man is not supposed to be simply working for the company, but working *with* the company. . . . Acipco is not an old folks' home. It is not a gold mine. It is not a hobo summer resort, where there is nothing to do but sleep and eat. It is not a rich man's hobby devoted to the overhauling of humanity. It is a place where every man has his chance. It is a place where the effort is made to teach the most humble workman that the company's success or failure in proportion depends on him: that he is concerned as much in the welfare of the industry as the president of the company; that his success and the company's success are identical."

In undertaking a work of this sort among a mixed white and colored population one of the first questions which naturally occur to the mind of a business man is the question of race antipathy. The result at Acipco proved to be a good illustration of the saying that "our worst troubles are those which never happen." There has never been the slightest friction between the races; on the contrary, the work has promoted a more harmonious relation than ever existed before, the white men feeling a certain responsibility for the conduct of the colored men, and the colored workmen maintaining a respectful attitude toward the place and its surroundings.

The complete story of the development is most interestingly recounted in this pamphlet, together with the reasons which actuated every move and numerous unsolicited letters from both white and colored men who felt and acknowledged the benefits growing out of the system. The illustrations present an unusually vivid impression of the various social and athletic activities which regularly take place, and "register" firmly upon the mind of the reader the general happiness and good-fellowship between employers and employees which prevails. The work is designed especially for the information of those who would know more about how such results were achieved, and is well worth the attention of those who face difficulties in promoting contentment among their workmen.

Method of Least Squares Applied to Estimating Errors in Coal Analysis

Technical Paper No. 171 of the U. S. Bureau of Mines. Paper binding; 9 x 6 in.; 36 pages; one halftone illustration and numerous photographs, tables, etc. Authors, J. D. Davis and J. G. Fairchild. Obtainable from Superintendent of Documents, Washington, D. C. Price, 5 cents. Published September, 1918.

As a contribution to the increase of efficiency in the utilization of fuel, the authors have sought to describe a definite method for estimating the probable limits of error in analyzing samples of coal and to show how this method, that of least squares, should be applied. According to Messrs. Davis and Fairchild, E. G. Bailey has shown that the method of least squares is applicable to the problem of sampling coal; it can be used to determine the limits of accuracy of sampling and for preparing standardized methods of sampling, but apparently the accuracy of the ordinary methods of analyzing coal had not heretofore been investigated by a mathematical method.

It is customary to estimate the limits of accuracy of analysis by observing the agreement of duplicate determination; that is, from general experience with a given kind of analysis. Hence, as some sets of duplicates are found to agree more closely than others, this question arises: What is the widest variation and what is the average variation reasonably to be expected? Or, in other words, the question is: What is the magnitude of the "probable error" of a single determination and what is the maximum error to be expected, say, once in 1,000 determinations?

The writers have tackled the problem by first carefully working out the limits for a few coals that were selected as typical, and then comparing the results so obtained with data compiled with numerous check determinations taken consecutively from the laboratory records. The number of check determinations was usually 1,000, and the experimental work was all done by the same analyst; hence the effect of the "personal equation" was eliminated from the results. On the other hand, the data taken from the records included the work of several analysts, so that the personal equation was here involved. Moreover, the experimental work for a given result took only a day or two, whereas the data represented in the compilation from the records represented at least a month's analyses, so that the variations chargeable to changing conditions in the laboratory probably were involved in the recorded results used. The subject matter of this publication takes up in detail the preparation of the sample of coal for analysis, the error of the ash determination, the error of moisture determination, the error in volatile-matter determination and the error in heating-value determination.

According to conclusions drawn by the authors, the results obtained through the application of the theory of probabilities would seem to indicate rather clearly what degree of precision may be expected with the coal analysis when the quantities determined are defined by the actual methods used for the analysis. When the error corresponding to a probability of one-half is taken, the errors involved in sampling and analyzing coal may be taken to be as follows: In taking the 5-lb. gross sample, about 0.04 per cent of sample, because of failure to include or exclude impurities represented is ash in the analysis; in the

ash determination, 0.08 per cent; in the moisture determination, 0.04 per cent; in the volatile-matter determination, 0.15 per cent, and in the heating-value determination, 0.15 per cent. Combining these possible errors makes a possible error in calculating the heating value of coal substance of about 0.18 per cent of the total heating value.

The limit determining rejection is often taken as the error whose probability is 1 in 1,000, which is 4.9 times (or, roughly, five times) the probable error of a single determination; the outside limit for error in the above determinations may be easily calculated. The limits of error, the authors conclude, would then be as follows: For sampling, 0.20 per cent; for the ash determination, 0.40 per cent; for the moisture determination, 0.30 per cent, and for the heating-value determination, 0.75 per cent. The writers believe, in view of this, that the limits allowed by the committee on coal analysis of the American Society for Testing Materials are not limits outside which, with ordinary care, determinations would never fall, but rather that the committee means to designate limits within which a large percentage of the errors will fall.

Efficiency One Thing—The Employment of Intelligence in Order to Accomplish a Result by Other Means a Very Different Matter

(*Continued from page* 116.)

success; yet, nevertheless, he did succeed. Foreigners took the idea and advanced it. It is said that the submarine is not a German invention. It is said also that the Germans did not invent mustard gas; but they took the idea and developed it. That is what I mean by knowledge further developed in the direction of efficiency; and our institutions, whether they be such as yours or schools like the University of Pennsylvania, should be ready to develop all kinds of knowledge which may be applied, and should apply that knowledge. In addition, some corner of the institution should be reserved for those who are interested in acquiring new knowledge for its own sake; because, after all, it is such new knowledge which points the way for those who take the knowledge and employ it in other directions.

Judgment

There is another factor which comes into all our work, a factor of great importance, and that is what I can only vaguely call *judgment*—the exercise of good judgment. Good judgment is only to be acquired as the result of experience. I can see it with every individual that I examine. It comes out in the simplest test—in the judgment which he exercises in solving the test. He must choose certain methods of operation if he solves the test which I put before him, and he will use good judgment or bad judgment in solving it.

Then, there are certain principles which underlie good judgment which are mainly balance and common sense. I think it is commonly admitted of the French and of the English that throughout their political development there has been manifest a faculty of common sense. They say, "Believe in this ideal, but do not believe in it too strongly"; "Do this, but do not do it too hard." Some refer to it in derision, for there is something of the cult of the amateur about it. But, on the other hand, it has led to a spirit of compromise, a spirit of discussion and a spirit of common sense. This has come out distinctly in the war. What the Germans have done was to choose a certain principle of action. People, whether as individuals or as nations, must choose certain principles to govern their actions. The Germans chose *force*—a good idea; an idea which appeals to many of us. We do not reject force. But they chose force and elevated it to an *ideal*—to something which was to be made irresistible and which was to be carried out to the limit, no matter what humanity or morality might have to say against it. On the other hand, other nations said, "We believe in discussion, in argument, but with force in the background." They said, "We wish to bring the relations of nations to a place where questions can be settled as a result of discussion and persuasion, with force only to be used as a last resort."

Balance and Common Sense

This principle of compromise is often applied to our moral principles. "Honesty is the best policy," we say; and so it is. That is, the ideal to make—to put before a man as his standard of living. Yet anybody who lives in the world knows that success is conditioned not only by following that policy—it is conditioned often by making compromises with it. The same may be said of lying. It is not safe to say, as Bethmann-Holweg said, that "necessity knows no law." As a proposition it *does* know no law under certain circumstances, but that is not the proposition to put before humanity as a role of action. Judgment calls upon us to select the opposing principle of law which yet permits of exceptions. We say that we are law-abiding citizens, but each man feels he has a right within himself to annul the law when it comes to certain critical situations.

When I was in Italy I had a very interesting illustration of this, which, among other things, made me say, "After all, Italians are very much like ourselves." Several men were arrested on the train traveling from Messina down to Syracuse, along the eastern coast of Sicily, because they had kept the curtain of their window up. The printed orders in the compartments were: "All curtains are to be drawn as soon as the lights are lit"—the reason being that there were German submarines along the coast and they were fearful that they might be shelled. One of these men when arrested said he did not know he had to pull the curtains down. He was asked, "Didn't you see the sign up in your compartment to the effect that the curtains must be pulled down?" "Yes," he replied, "I saw the sign; but I also saw the signs 'Don't spit on the floor' and 'Don't smoke,' but nobody ever pays any attention to them."

Compromise

It seems to me that in the selection of our rules of conduct and in the way in which those rules of conduct are lived up to you will always find that the principle which has brought success to some men or groups of people has been the principle of compromise. And today, when we are confronted with the uncompromising attitude of some of the socialistic minorities, you can understand exactly what I mean by that spirit. Whatever we may think of their doctrines, whether we think they are good or bad, there is the additional question of our having to deal with groups who will apparently de-

cline to enter into any compromise at all—who either want the whole loaf or none. A certain balance and judgment which I think exists in political life and in ordinary affairs is to be found in every single performance, at least as I have observed it in the laboratory—a certain balance and judgment in deciding what the course shall be. I suppose a certain amount of luck enters into it in choosing the one to be followed and those which will lead ultimately to success.

In all this, as I see the situation which comes before us, there are those two main questions: an external one of the operation or performance—the man in action and the estimate of his action as such, and efficiency is a term which relates to that; on the other hand, there is the internal—the man who carries within himself certain capacities, certain abilities, which we indicate when we say, "He is an able man; he has intelligence, intellect, sound judgment."

I think it may help everyone, as it certainly helped me, if we distinguish between this external aspect of work which is efficiency and these internal attributes which may result in efficiency. A competent man—a healthy man—is not necessarily efficient. He has the advantage over the sick man in being able to develop efficiency or to be trained for efficiency. If we are selecting men on whom we are going to spend time and effort in training, undoubtedly we want to select the more competent men.

The Problem of the Schools

Whenever I am taken into consultation regarding the question of training young men for careers by any institution, I always say to them, "If you are trying to give these men a certain amount of professional training—efficiency on the one hand and skill on the other—and you wish to fill their minds with a certain amount of knowledge which you hope that they will employ, you ought to put it before them in such a way that they will employ their intelligence so that it will not become deadened through the other kind of training, because efficiency training does deaden intelligence."

That is the problem of the school; but an equally important problem, if we are going to send out into the world well-trained professional men, is to eliminate the unfit from the schools. To my mind it is every bit as important a question in college or in professional schools as the actual curriculum and the methods of giving instruction in the institution. We must devise some method whereby we can select those men whom it is worth while to train. So that competency comes up in connection with our institutions of higher learning, just as it comes up in connection with our lower-grade work. Take, for example, in the public schools, one of the problems which I have to face many times: that of the fourteen or fifteen year old boy or girl who has advanced only to the third or fourth grade, and who is not able to satisfy the requirements with respect to English and cannot get his working certificates until he is sixteen years of age. I make the examination, determine what his efficiency is in reading and writing, and decide that within the time of the school period he cannot be brought up to the level required by law. Eliminating other considerations, to my mind it is very much better to let him go to work under, perhaps, certain kinds of guidance than to force him to attend a school where he will simply spend another year or two doing little or nothing; because the results of the examination have shown that he has not the interior competency which will enable him to acquire the efficiency demanded in school work.

Conclusion

Psychological tests were employed in connection with the selection of men for the army, both as privates and as officers; and, to my mind, there can be no doubt that they are going to be further and further developed. As a result of the war and what will grow out of it, we are going to have a tremendous development of industrial organization along the line of efficiency and along the line of the acquisition of ideas which can be put into application. It is certain that our professional schools will become more numerous. Already Government subsidies have been given for the establishment of such institutions in England, and I have no doubt at all that the American people will also take that in hand. In fact, they will have to, to keep in the race.

We need not fear, therefore, it seems to me, for the satisfactory development of professional schools; but we *do* need to fear for the maintenance and further development of schools that are going to have as their main object the cultivation, the acquisition and the discovery of new knowledge for its own sake. If our college is such an institution, where intelligence is to be exercised rather than knowledge acquired, then it ought to be the college. If it is the graduate school, then it means the further development of graduate schools. I believe that all professional men can be made to understand an analysis of these different factors which make for success, and that, after all, while it does not necessarily make for the immediate success of any one particular man, nevertheless one of the most important factors in the training of the mind is to be interested in and to acquire knowledge for its own sake instead of for the sake of using that knowledge to secure wealth or success.

Gas Service Available but to Half of Population of Missouri

Gas service is available to less than half of the population of Missouri, according to statistics contained in the annual report of the Missouri Public Service Commission issued in final form last week. A tabulation of the 500 utilities operating in Missouri shows that 45 of them furnish gas service, 381 furnish electric service and the balance water.

The forty-five gas companies of Missouri operate in cities having a total population of approximately 1,500,000 persons. The population of the State at the 1910 census was approximately 3,500,000 persons.

Among the other bits of interesting information revealed by the statistics are that seven gas companies of the State serve communities of less than 1,000 population each, and twenty-nine gas companies serve cities of less than 10,000 population each. The low record is held by the Frechman Gas Company, of Morrison, Mo., which serves a community whose population is exactly 257 souls.

There are twelve combination gas and electric companies in Missouri, the report shows. Only two companies in the State operate in cities of more than 100,000 population, the Laclede Gas Light Company, of St. Louis, which caters to a population of 800,000, and the Kansas City Gas Company, to a population of about 300,000.

Pays for a 20c Lunch with a $110 Heater

H. J. Long Also Takes Occasion to Prophesy Extensive Merchandising Campaigns in Gas Field

By LOUIS RESNICK

"I find a most optimistic feeling among the gas men I have visited, and in nearly all companies preparations for extensive merchandising campaigns are under way. The exceptions are the places where for some special reason local conditions are unsettled."

Such was the statement of H. J. Long, president of the Long-Landreth-Schneider Company, of New Brunswick, N. J., "Kompak" water heater manufacturers, in answer to a question of the St. Louis correspondent of the AMERICAN GAS ENGINEERING JOURNAL concerning conditions in the industry, as viewed by a traveling man.

BASED ON EXTENSIVE INVESTIGATION

Mr. Long was interviewed at St. Louis last week as he was preparing to start homeward after having visited and discussed the gas appliance situation with officials of companies in Boston, other New England cities, Albany, Detroit, upper Michigan points, Chicago, St. Louis and intermediate points.

"With just one or two exceptions," Mr. Long said, "every company I visited is laying plans for increased commercial business. Equally gratifying with the bright prospects for the future is the very apparent fact that the exigencies of the war have put most gas companies on a more practical merchandising basis.

"No longer is the gas appliance sold merely to get it on the line. This is an exceedingly encouraging sign. It means cleaner-cut business methods and more real competition. It means that gas companies will henceforth show greater interest in the sale of appliances and, of course, will earn greater profits therefrom."

As an example of the scope on which gas companies are entering the merchandising field Mr. Long cited the Michigan Light Company of Jackson, Mich., which has set out to sell 1,500 "Kompak" water heaters during 1919.

NO SPECIAL DESIGNS

Mr. Long indicated that the exigencies of the war had also taught the manufacturers of water heaters a lesson or two. For one thing, he said his own company will, during the next year, confine itself to the manufacture of just two sizes of heaters, the No. 18 and No. 32. The company, he said, will not make any tank heaters this year though it had been turning out eight to ten thousand such appliances annually. Nor will any special designs be made, he said.

CONFIDENCE IN THE FUTURE BACKED BY DOLLARS

Plans for a large addition to the plant of the company at New Brunswick which will be approved immediately upon his return, Mr. Long said, will enable the company to increase its 1918 output by 100 per cent.

Mr. Long announced the following expansion of the sales department of the company: W. A. Devine, who last year covered the Connecticut territory for the company will now have charge of sales in New England and upper New York State, with headquarters at New Haven, Conn. D. W. Pennington, with headquarters at Chicago, will represent the Long-Landreth-Schneider Company in Illinois, Indiana, Michigan and other Middle Western States. A representative to take care of the St. Louis, Missouri and Southwestern trade will be appointed in the near future, Mr. Long said.

Mr. Long's visit to St. Louis will long be remembered by at least one organization, the St. Louis Community Kitchens Association, "a self-supported cooked food service operated for public benefit, not for profit."

THE FIRST TO BE SEEN IN ST. LOUIS

While dining at one of the Community Kitchens with J. J. Burns, superintendent of the commercial department of the Laclede Gas Light Company, Mrs. E. T. Senseny, founder and director of the Community Kitchens and the writer, Mr. Long was so impressed with the uniqueness of this enterprise that he decided to pay for his twenty-cent luncheon with a $110 heater. And so the first "Kompak" heater to be seen in St. Louis will go to Community Kitchen No. 2 as a gift.

Five Committees Appointed by Fuel Auxiliary of Illinois Manufacturers' Association

The Fuel Auxiliary of the Illinois Manufacturers' Association has appointed five full committees, one assigned to conduct investigations relating to each of these kinds of fuels: Solid fuels, oil, gas, electricity, powdered coal.

The auxiliary has invited members of the association to present their fuel problems through Secretary J. M. Glenn. It is planned to hold several general meetings of the auxiliary during the year.

In addition to the study of problems submitted it is intended to arrange that inquirers shall be permitted to investigate the working of the fuel recommended as exhibited in a plant using it.

Cities Service Subsidiary Erecting Tanks and Laying Gathering Lines in Texas Field

The Empire Pipeline Company, the oil transporting division of the Western subsidiary of Cities Service Company, has commenced operations to enter the Burkburnett oil field in Texas.

Workmen are already laying gathering lines in the famous Texas pool, a big 55,000-barrel tank and a 10,000-barrel tank are being erected, and a double loading rack that will accommodate two whole trains of tank cars also is being constructed.

The oil will be shipped to the Gainesville refinery a distance of less than 100 miles. The Gainesville plant, which ordinarily is supplied by Healdton crude, has a capacity close to 15,000 barrels besides the largest concrete oil reservoir in the world. The Empire is especially fortunate as far as the transportation problem is concerned, having not less than 2,100 tank cars.

The Burkburnett pool, discovered last summer, lies right under the town of that name, and is the wonder city of Texas. So far the limits of the pool have not been discovered. The pipeline companies already in the field are not nearly able to take care of all the production. It is estimated that 38,000 barrels gush from the earth daily and only 20,000 are being piped out. The rest is run into storage waiting for additional pipeline facilities.

O. D. Bradford, superintendent for the Healdton district of the Empire Pipeline Company, has been transferred to Burkburnett to superintend operations. Burkburnett will be included in the Healdton district. Thousands of feet of pipe, most 4-in., to be used in the construction of gathering lines already have arrived at Burkburnett.

Ban Against the Use of Natural Gas for Industrial Purposes Should Not Be Revoked

A letter from T. B. Gregory, head of the oil division of the United States fuel administration, to John McPhee, city attorney of Muncie, Ind., asking whether the ban against the use of natural gas for industrial purposes in Indiana should be continued until April 15, has been answered by Mr. McPhee, who also is president of an association of Indiana city authorities. McPhee advised the national administration that the order be not rescinded before the date set for its expiration. Mr. Gregory's letter pointed out that his department had received much adverse criticism from the gas companies against the order, and wondered whether the ban had not served its purpose in giving more fuel to domestic consumers through the winter months. If it has, he said, the gas companies' criticism would be disregarded, but if it had not the ban would be lifted.

In his reply, Mr. McPhee said that every city affected by the order in central Indiana has "nothing but words of praise for the fuel administration," because the cities affected have been provided with plenty of natural gas for domestic consumers under the fuel administration's ruling. It is understood that factories in Muncie and in other cities of the State, whose natural gas supply has been cut off by the order have suffered great inconvenience, and the manufacturers and gas companies assert that there is enough gas now for both domestic and industrial consumption in Indiana, except in the event of severely cold weather.

Chicago Companies Plan Campaign to Extend Use of Gas in Industrial Plants

Chicago gas companies are making plans at the present time for a vigorous campaign to extend the use of gas in industrial plants. The war-time orders installing gas as a substitute for coal in manufacturing afforded opportunity to prove the superior efficiency of gas as a fuel. It was adopted in many forms of heat treatment, and according to officials of the gas companies in Chicago, it is not yet noted that gas is being ordered out.

The varied work in which gas fuel has been clearly established as most advantageous gives the gas companies a distinct argument for use in their campaign. It is planned to add to the number of industries now using gas many smaller concerns. The fact that restrictions relating to the use of coal, in force while the Allies and America were daily meeting Germany in battle, have been largely or entirely removed, leaves an open field in which gas fuel has a decided advantage.

Two Long Island Companies File Increased Rate Schedules

The Public Service Corporation of Long Island on Jan. 4, according to a tariff filed with the Public Service Commission, Second District, New York, proposes to put into effect in Great Neck Estates and Plandome and the towns of North Hempstead and Hempstead these changes in the rates for gas:

Minimum charge of 50 cents per month established in connection with rates for gas for fuel, lighting and power. Rate for gas for power available to all consumers, increased from $1 to $1.15 per 1,000 cu. ft. and made available for both power and the heating of buildings.

The Long Beach Gas Company in Long Beach and the town of Hempstead in a tariff filed with the commission, proposes to put into effect these changes in rates for gas:

New two-charge rates for gas, available to all consumers for fuel and lighting, established as follows: Service charge, $1 per month. Block rates, per 1,000 cu. ft. net, $2 for the first 5,000, $1.90 for the next 1,000, $1.80 for the next 1,000, $1.70 for the next 1,000, $1.60 for the next 1,000, and $1.50 for the next 1,000, and all over 10,000 cu. ft.

Empire Company Moving Departments into New Building

To the telephone and telegraph departments belongs the honor of being the first department to move into the Empire Gas & Electric Company's new home in Bartlesville, Okla. The gasoline department, Dr. Sidney Born's chemistry division and the stationery department also have been housed in the structure.

The process is necessarily slow on account of the finishing touches. It will be a couple of weeks at least before everything is completed.

In the meantime, the different offices will be moved gradually without the confusion that is generally incidental.

Waycross Plant Damaged by Fire

A fire that at one time looked as if it would destroy the entire plant of the Consumers Gas & Coke Company did considerable damage to the gas company's plant Jan. 18. But for the work of the fire department, Waycross would have had the largest fire that has been seen there for some time. By strenuous work the flames were confined to the building and were not allowed to reach the gas tanks.

Missouri Commission Rules that Equipment Repair Charges Do Not Come Under Its Jurisdiction

Charges for repairs to gas lighting and heating equipment do not come under the jurisdiction of the Missouri Public Service Commission, that body ruled recently in declining to pass upon a schedule of repair charges presented for the commission's approval by the St. Louis County Gas Company.

In reply to the gas company's request for approval of this schedule the commission said the company may charge its consumers for doing the work specified in the proposed schedule, but the commission declined to undertake to regulate the amount of charges.

The St. Louis Gas Company's schedule calls for a minimum charge of 75 cents for handling any customer's premises complaint requiring one hour to execute, providing the complaint was not a direct result of the quality of the gas or the condition of the company's service. A charge of "cost plus 10 per cent" would be made for filling any premises complaint requiring more than one hour to execute.

The commission, in considering this petition, ruled that where the quality of gas is concerned the company must make repairs without cost to the consumer. This petition, which was finally acted upon by the commission on Jan. 17, was filed last August.

Refinancing of Central Gas Company

As an aftermath of the litigation of 1917 resulting from the financial difficulties of the Central California Gas Company and a foreclosure suit by the Los Angeles Trust and Savings bank, the Central Counties Gas Company has filed with the railroad commission an application for a permit to transfer bonds and issue stock to enable the corporation which was organized to take over the affairs of the defunct company, to carry out the terms of a bondholders' agreement. At the time the Central California Gas Company got into difficulties, the Los Angeles bank held a trust deed on the property secured by $300,000 worth of bonds. It is now proposed to substitute for these bonds bonds of the new corporation, of an equal face value plus $75,000 worth of common stock, which the bondholders agree to accept at 80, the stock to be used in settlement of interest claims amounting to $38,000. It is also proposed to sell 27,500 shares of the common stock on the basis of 80 to provide funds for the expenses attendant upon the litigation, and to provide a fee of $2,923.53 for the services of the reorganization committee.

Beatrice Company Old Rate Effective from Jan. 1

The gas rate fight in Beatrice, Neb., is at an end, the city commissioners agreeing to allow the gas company to collect for the month of December on the $1.80 basis per 1,000 cu. ft. Beginning with January the old rate, $1.60 per 1,000 cu. ft. will become effective.

Employee of Consolidated Given Dinner Upon Return

Gassed and Severely Wounded—Sixty-seven Pieces of Shell Removed from His Body

John W. Grimmer, a chauffeur employed by the Consolidated Gas Company of New York for nineteen years, who, as first sergeant of Company I, 105th Infantry (the old 71st Regiment), was gassed and severely wounded during the Cambrai drive at Peronne on Sept. 29, 1918, and from whose body sixty-seven pieces of shell were subsequently removed, was given a dinner by his fellow chauffeurs Jan. 31 at Allaire's Restaurant, 165 East Seventeenth Street. All the executive officers of the Consolidated Gas Company attended the dinner. Sergeant Grimmer was presented with a bronze statue showing the figure of a soldier going "over the top."

Sergeant Grimmer arrived on the steamship Lapland on Jan. 19. He was removed to the Fox Hills, S. I., hospital, and on Wednesday last was again removed to the Hotel Nassau, Long Beach, which has been converted into a hospital. There he is under treatment for several hours each day, having a badly wounded leg baked and massaged. Until he was transported home Sergeant Grimmer was from the time of being wounded a patient in the Duchess of Connaught Canadian Red Cross Hospital, Cliveden, Taplow, Bucks, England.

George B. Cortelyou, president of the Consolidated Gas Company, was one of the speakers at Sergeant Grimmer's dinner, as were also Robert A. Carter and Walter R. Addicks, two vice-presidents of the gas company. Other officers of the Consolidated who were present were Chief Engineer William H. Bradley, W. Cullen Morris, Robert E. Livingston, Frank R. Barnitz, H. B. Reinach, H. M. Brundage and Captain Collin C. Simpson, who has just returned

from service on the other side. Also present were these fellow chauffeurs employed by the company: Vincent P. Redden, Hugh J. Lincoln, George Binninger, William McCaffrey, Edward Martin, Arthur Lyons, Arthur Silkworth, Charles Cavanaugh, Edward Callan and H. V. Middleworth, superintendent of the garage.

Sergeant Grimmer is a veteran of the Spanish-American War, was with the 71st Regiment on the Mexican front and during the early part of the participation of the United States in the great war of Europe Grimmer was with his company on guard duty along the Croton water system in the Catskill Mountains.

At the dinner Sergeant Grimmer told of the manner in which he was wounded. He said that the 27th Division left Belgium, on the Ypres front, on Sept. 4, and went to Doullens, France, by train to billet. In that town there was lots of work in the fields training with the tanks. On Sept. 25 the troops were rushed off to the "Aimines front." At Peronne they left the train and were marched to Tincourt, and on Sept. 27 the 105th went over the top and gained 1,000 yards of the "Jerries'" front-line trenches. On the morning of Sept. 28 the 105th Regiment was relieved by the 107th Regulars for the purpose of giving the 105th a rest, which they never got. At midnight on Sept. 28 the order came for a big drive to start at 5.50 o'clock on the morning of Sept. 29. The 108th Regulars were on the left of the 105th and the 107th Regulars were on the right, with the Australians in the rear to mop up anything that had been overlooked by the troops in the advance. The tanks were in the rear of a barrage and the 105th was behind the tanks, and so it was, Sergeant Grimmer said, that the great drive of St. Quentin-Cambrai started. He said that before long the losses in the 105th were heavy. Half of his company was hit and all the officers were lost; but he, Grimmer, managed to get across the famous canal and right through the Hindenburg line. When the remnant of his company was ready to take a small town up on a hill the Huns came out of a tunnel under the canal and set up machine guns in the rear of the 105th and its flanks.

"We were in a nest for fair," Sergeant Grimmer said, "and there lost quite a few more boys. I had all my machine guns set up in shell holes and gave the enemy all they wanted, but could not locate their positions very well. One of my men was hit in the wrist by a bullet and he called for someone to dress the wound, as he realized that he would otherwise soon bleed to death. Although many were near him in shell holes none could help him, for a raised head meant death. The enemy were sweeping the tops of all the shell holes with machine guns and snipers' bullets. I took the chance and went over the top to where my comrade was lying, and I bandaged him up fine. He had fainted. I had 'close calls' reaching him, and as I started to go back to my shell hole they got me with three machine-gun bullets into my right thigh, near the right side of the leg. No bones were hit nor arteries severed, but the arteries were very much exposed. I dropped into a hole and managed to dress myself with a shell dressing. There I lay from 9.15 a. m. to 6 p. m., till dark, under heavy gas and shell fire. After dark four of my men carried me three miles on a rifle to a dressing station. I could not walk a step. All stations were too busy, so they put me on an auto-ambulance and took me twenty miles to a field tent hospital. At 11 o'clock they dressed my wounds, which were very ragged. I lay in that hospital till Oct. 2, when I was put on a hospital train and sent to Nouran, France, midway between Paris and Havre. After another auto-ambulance ride I arrived at the No. 1 General Australian Hospital. There they had me x-rayed and put on a table, and after four hours under ether they removed sixty-six small and two large pieces of copper, steel and lead from the thigh; and some hole they left! It is now 7 in. long, 4¼ in. wide and 5½ in. deep in my thigh. No one will ever know what I suffered when they dressed it. I just bit into a rough towel and never gave in—but, oh, my! The arteries are exposed; that's the reason I could not walk, but had to lay on my back."

Grimmer was taken by a hospital boat from Havre to Southampton, England; then taken by train to Taplow on Oct. 6.

Increased Rate Allowed Marshalltown Company

Judge Wade in a decision handed down recently upheld the Marshalltown (Ia.) Gas Light Company in its petition to charge a higher rate for its product.

Some time ago the company petitioned that it be allowed to raise the price from $1 per 1,000, ft. to $1.40, the additional charge of 40 cents to be put into a separate fund awaiting a decision by the court.

The decision not only approved the 40 per cent raise, but ruled that the company was allowed to make a profit of 8 per cent. This will make the charge amount to $1.50 per 1,000 ft.

Empire Engineers Hold Two-Day Session

About forty-five engineers employed by the Empire Gas & Electric Companies had a get-together meeting Jan. 24 and 25 at Bartlesville, Okla. They came from all sections of the country where the Empire has interests and where engineering work is being done. J. J. Allinson, chief engineer, presided.

The climax of the two-day session came Saturday night when a dinner and smoker was held at the Hotel Maire. The Empire Quartette sang.

In the dozen or more papers which were presented, every phase of the engineering business from the mixing of concrete to the electrification of the oil fields came up for full discussion.

The following are a few of the interesting papers presented:

J. J. Allison: "Importance of Engineering Department to a Large Organization—Purpose of Meeting."

E. D. Cole: "Concrete."

S. B. Severson: "Oil Field Electrical Equipment, Installation, Operation and Office Records on Same."

Benjamin Greenfield: "Combustion Apparatus and Installations—Oil and Gas."

C. M. Johnson: "Drafting Room Organization."

W. F. Statham: "Stills."

S. Swartz: "Pressure Stills and Wax Plants."

A. H. Bell: "Vapor Towers and Condenser Boxes."

E. L. Peck; "Absorption Gasoline Plants."

L. D. Williams: "Compression Casing Head Gasoline Plants and Vacuum Stations."

S. A. Sulentic: "Oil Pipe Lines

and Pump Stations—Construction and Operation."

H. W. Camp: "Co-operation of Resident Engineers and Plant Superintendents."

Clay Briggs: "Best Methods for Outlining Work to Foremen, and Handling Labor in General."

R. R. Blase: "How to Obtain Better Co-operation Between Field Engineers and Main Office."

F. D. Whiting: "Warehouse Problems on Construction Work and How to Handle Them."

Program Outlined for Annual Meeting of New England Association of Gas Engineers

The forty-ninth annual meeting of the New England Association of Gas Engineers will be held at the Copley-Plaza, Boston, Feb. 19-20, 1919.

The annual dinner will be Wednesday evening at 6.30.

Applications for membership should reach the secretary before Feb. 18.

The following papers have been prepared:

"Chemical Control of Water Gas Sets in Small Works," H. von Vittinghoff; "Steaming Verticals," L. J. Willien; "The Employment of Women as a New Factor in the Gas Industry," Geo. H. Priest; "The New Water Gas Plant at Providence," W. M. Russell; "Church Lighting by Gas," Philmer Ives; "Report of Committee on Coal and Oil Supply," Dr. J. F. Wing.

QUESTION BOX

"Combustion of different mixtures of water and coal gas and modification of appliances to cover same, with special reference to the B.t.u. basis."

"Manufacturing changes due to war conditions."

"Are women workers who took the place of men during war emergency to retain positions?"

"How are welded steel mains standing up?"

"What is the future market for light oils under peace conditions?"

"Purification problems using high sulphur coals."

"What methods are used to lessen cost of operation of gas company automobiles? Example: Are drivers paid a bonus on tire mileage?"

"What methods are used by gas companies to break frozen ground when excavating for gas leaks?"

"Has anyone had experience with the 'Thrift Burner'?"

"Use of carborundum-lined generator blocks?"

"What success has been had recently with house heating by gas in New England?"

Please bring to the meeting information about the above subjects, and from your experience help to solve the problems.

Please notify the secretary of any change of address or position, and also give the names of any from your company who have entered the United States Government service.

All friends of the association are invited to attend the meeting and take part in the discussions.

Plan New Oil Laws

It is probable that new oil legislation will be put through the Kansas State legislature in session now at Topeka. To aid the lawmakers in every way possible, the Kansas Oil Men's Association which was organized last fall in Wichita, composed mainly of Butler county operators, has appointed a committee to explain in detail the needed legislation. Among those appointed is H. R. Straight, chairman of the managing committee of the Empire Companies.

The Kansas State officials plan legislation governing the production of oil; the handling of salt water, etc., to prevent pollution of streams, especially having in view Walnut River, which furnishes water supply to a large number of people. In connection with this plan it is proposed also to reconstruct the laws governing the geological survey and perhaps create a commission similar to the Oklahoma Corporation Commission. The Kansas State board of health at Lawrence is active in the matter.

Billings, Mont., Rates Increased

Increase in gas rates in Billings, Mont., went into effect Feb. 1, following an order just received from the railroad and public service commission of the State, before which a hearing was held in Billings on Oct. 8. The increase will amount to between 9 and 10 per cent for domestic consumers.

Under the present rates the average monthly bill for use in homes is about $3, according to gas company officials, and under the new rate will be slightly less than $3.30. The company asked for an increase of 25 cents per 1,000 cu. ft., and the commission granted an increase of 15 cents, raising the price from $1.80 to $1.95 per 1,000, from which a discount of 10 cents per 1,000 is allowed if the bill is paid before the 10th of the month following that in which it is rendered.

Realizing that the company's rates to industrial consumers, such as restaurants and other business places using gas in large quantities, has been too low, as compared with the rate charged for residence service and cost of production, the commission allowed the gas company the increase asked for in these rates. This amounts to 50 cents per 1,000 cu. ft., raising the price from $1.10 to $1.60 per 1,000, from which a discount of 10 per cent is allowed if paid within the specified time.

"This increase may seem large," said R. C. Cardell, manager of the company, "but when compared with the increase in the cost of coal in the past two years, it is not at all unreasonable. The commission has seen fit to give us a raise on the rate which requires those who can best afford it to pay the increased cost."

At the hearing the company stated that it was asking an increase in rates for the purpose of paying operating expenses, depreciation and interest on its bonds and outstanding obligations, so as to maintain its credit, and not at that time asking the commission to allow it to earn a fair return upon the value of the property. The commission, after investigating the statements made by the company as to the valuation and earnings, concluded that the company was justified in its request for an increase in rates, because of the abnormal increase in operating expenses.

In its request for increase, the company asked permission to raise its minimum charge from 50 cents per month to $1, and the commission granted an increase to 75 cents. A service charge of 25 cents per month, over and above the cost of the gas consumed was asked, but this was not allowed by the commission.

The order granting the increase was dated Jan. 25 and takes effect Feb. 1. It is as follows:

It is ordered that the application of the Billings Gas Company for an increase in its gas rates be and is hereby granted in a modified form.

It is further ordered that the Billings company shall, not later than Jan. 31, 1919, file with this commis-

sion the following amended schedule of rates:

Commercial Rates

First 3,000 cu. ft., $1.95 per 1,000 cu. ft.
Next 2,000 cu. ft., $1.75 per 1,000 cu. ft.
Next 10,000 cu. ft., $1.65 per 1,000 cu. ft.
Next 15,000 cu. ft., $1.50 per 1,000 cu. ft.
Over 30,000 cu. ft., $1.30 per 1,000 cu. ft.
Minimum monthly charge, 75 cents.

No discounts allowed unless bills are paid on or before the tenth day of the month following that in which gas is used.

Industrial—Heating, Power and Combination Heating and Lighting Rates

First 5,000 cu. ft., $1.60 per 1,000 cu. ft.
Next 10,000 cu. ft., $1.50 per 1,000 cu. ft.
Next 15,000 cu. ft., $1.40 per 1,000 cu. ft.
Next 30,000 cu. ft., $1.30 per 1,000 cu. ft.
Next 40,000 cu. ft., $1.25 per 1,000 cu. ft.
Over 100,000 cu. ft., $1.20 per 1,000 cu. ft.
Minimum monthly charge, $1.

J. J. Burns Appointed Director of Equipment of St. Louis Community Kitchens Association

J. J. Burns, superintendent of the commercial department of the Laclede Gas Light Company of St. Louis, has been chosen Director of Equipment of the St. Louis Community Kitchens Association. Mr. Burns was largely instrumental in establishing the community kitchens in St. Louis, which during the war provided hot and well balanced meals at cost to war workers at plants which had no restaurant and to the families of such workers. Henceforth the community kitchens will devote themselves largely to feeding school children in the slums of the city.

The kitchens use only gas-fired equipment. Requests for plans and descriptions of the St. Louis Community Kitchens received by Mrs. E. T. Senseney, principal organizer and director of the association, indicate that a number of Eastern cities are planning to establish such enterprises. Through the cooperation of Mr. Burns the kitchens have been made self-supporting. The element of charity does not enter into their work.

THE ROBERT E. GREGG OIL & GAS COMPANY, Wilmington, Del. To acquire lands containing petroleum, mineral gases, etc., and to develop same; capital $500,000.

Chicago Company Changes Name and Increases Capital

The Ledine Construction Company of Chicago has been granted permission by the office of the Secretary of State at Springfield, Ill., to change its name to Midland Engineering Construction Company, and to increase its capital stock from $20,000 to $100,000.

Peoples Gas Books to Be Audited and Exceutive Bills to Be Investigated

The books of the Peoples Gas Light & Coke Company of Chicago will be audited, and complaints of excessive gas bills will be investigated by the Illinois public utilities commission. The commission will direct a house-to-house canvass by meter readers to get first-hand information concerning recent bills.

Where it is found that the company has charged excessive rates, the consumers will be allowed cash rebates. If the consumer is found to have profited by mistakes of the company, the company will be reimbursed.

Samuel Insull, chairman of the board of directors, announced the company would do everything possible to aid the investigation. The pany will make no protest against the order as a whole. If a study of the order reveals minor points it considers unjust, the company will ask to have such details modified, however.

Mr. Insull denied that Vice-President E. J. Ward had been ousted as a result of recent complaints of overcharges by consumers. "He has resigned, over my protest, because of ill-health," Mr. Insull declared. Mr. Ward is now at a Florida winter resort.

The meter-readers will not be provided with the yearly readings of the consumer's meter, but will be compelled to actually go to the meter. Commissioner Walter A. Shaw explained this by the assertion that it would obviate any dishonesty on the part of the meter-readers.

Concerning the basis of settlement with the consumers who shall be found to have been overcharged, the order states that the supervisors shall make an average of the number of gas-feet burned by the consumer per month, beginning with May 1, 1918, and ending with Nov. 1, 1918. The consumer will then be charged according to the old rate, effective prior to Sept. 1, 1918, for the average monthly amount consumed prior to that date, and according to the new rates for the average after that date.

The total amount thus arrived at shall be compared with the amount actually paid by the consumer or charged to him, and the difference, should it be in the favor of the consumer, paid him in cash or credited on his account as the case may be.

From June 1, 1918, to Dec. 10, 1918, 4,146 complaints were received at the office of the department of public service of the city. The largest number of the complaints concerned exorbitant bills.

"Taking the record as a whole," the statement of the commission reads, "there was a complete breakdown in the efficiency of the company in the matter of meter readings, bill adjustments, bookkeeping, courteous treatment of consumers and service generally, indicating, unmistakably, that there is something radically wrong in the organization of the company.

"It appears that the company has, in round numbers, 651,000 consumers; that the total number of the company's employees is about 5,000; that the normal number of meter-readers employed is 140; that at the time of the hearing the number was 168; that due to the war draft and other causes there was some 'turnover' of meter-readers between Jan. 1 and June 1, 1918, so that by June 1 practically the whole of the meter-reading force, as it existed the first of the year 1918, had been replaced by new employees, the changes being gradual, however, and producing but little trouble with reference to bills; that about June 1, 1918, not only in the meter-reading department, but in other departments, employees left the company in large numbers and sought employment where they could get more money; that early in June, 1918, there was a strike, and the whole meter-reading force walked out; that during the month of June the company hired 107 new meter readers, and from this time the crew was new, the 'turnover' being constant; that in June the company hired 121 and lost 106; in Au-

gust 126 were hired and 95 lost; in September 126 were hired and 92 lost: that during June, July, August and September 559 were hired and 504 lost.

"From June 23 to July 6, a period of thirteen days, during the strike, the company estimated gas consumption and billed customers according to said estimates, the estimate being based on readings for the preceding month. These bills, however, were rubber-stamped 'estimated' on the face thereof, thus indicating to the consumer they were subject to correction.

"It appears further that during said four months' period a considerable number of meter-readers employed were wholly incompetent, irresponsible or unreliable and returned to the officers of the company what purported to be actual meter readings, but which in fact were estimates or guesses. During said period of four months many of the meter-readers employed were boys from 17 to 20 years of age, and women. Each carried a book containing a record of meter readings for previous months, and these readings they used without going to the premises and actually reading the meters. This practice, as well as the estimating of readings by the company itself from June 23 to July 6, is the immediate cause in a large measure for the evils complained of by consumers.

"The unavoidable inference from the record is that the executive officers themselves have been lacking in the proper conception of the duty of the company to the public served by it, and that they have not been sufficiently impressed with the value of the good-will of gas consumers as an asset of the company.

"The commission is of the opinion that until the officers of the executive department themselves shall acquire a different conception of the duties the company owes the public, and the rights of its consumers, there will be no material improvement in the attitude of the employees in the meter-reading and adjusting departments toward those of the consumers with whom employees come in direct contact."

Concerning the suggestion of officials of the City of Chicago, that a public adjuster be appointed by the city for the purpose of supervising the adjustment of complaints the commission states:

"This suggestion the commission has most carefully considered, and has reached the conclusion that it would be practical. The commission is of the opinion that the company should not be relieved of the responsibility of reforming its organization along lines hereinbefore suggested, of selecting, training, disciplining and directing its employees; but that it should continue to assume such responsibility and be held in strict accountability for the furnishing of adequate service and fair and courteous treatment of its consumers."

Arrangements Completed for 12 Papers to Be Read at Illinois Gas Association Convention

Exhibits Limited to Twenty-five, Due to Lack of Space

An interesting program of an even dozen papers on important phases of the gas industry has already been made up for presentation before the fifteenth annual meeting of the Illinois Gas Association, which is to be held here Mar. 19 and 20. Indications are that this meeting will be the biggest convention of gas men held in recent years. An entirely novel feature will be the exhibits. Mr. H. H. Clark, secretary of the association, announces there are 115 possible exhibits, but that because of the lack of space at the Hotel Sherman, where the convention is to be held, it will be necessary to limit them to 25.

At the same time, however, requests are coming in from all sections of the country for permission to enter all sorts of modern gas appliances, stoves, etc. The committee in charge of the exhibit feature of the convention is striving to perfect a plan which will be satisfactory all around.

The twelve papers so far collected for the program deal with many of the subjects which loom largest in the interest of the gas world. The list is as follows:

Effects of the War on the Gas Industry, Merchandising, Higher Pressures for Distribution Systems, Appraisals for Rate Making, Modern Gas Lighting, Recording Instruments in the Gas Plant, Naphthalene, Gas for Commercial Baking, Some Gas Machine Factors involved in manufacture of Carbureted Water Gas, Fuel Conservation by means of Industrial Gas, Recovery of By-products and The New Business Department.

The convention will last two whole days in contrast with that of 1918 which, because of war conditions, was confined to a single day. An interesting feature will be the banquet which is to be held at the close of the first day's session.

Report Denied That E. G. Cowdery Had Resigned as President of Peoples Company

Reports which were ciruclated in Chicago this week that Samuel Insull, chairman of the board of directors of the Peoples Gas Light & Coke Company, had taken charge of the company's affairs; that E. G. Cowdery, president, had resigned, and that Charles A. Munroe, of the Public Service Company of Northern Illinois had taken his place, were indignantly denied today by the three men most concerned.

The reports were that Mr. Munroe had been made president of the company, relieving Mr. Cowdery because of the recent turmoil in Chicago gas affairs, which were charged to inefficiency of employees.

"Mr. Cowdery is still president of the company," said Mr. Insull.

"I have not resigned for my health or for any other reason," said Mr. Cowdery. "Mr. Munroe, who is reported to be successor is in reality successor to one of our vice-presidents. I am still president and will remain in active charge."

A denial also came from Mr. Munroe. "I am looking after things while Mr. Cowdery is away because of poor health," he said. "Mr. Insull is in charge of everything during Mr. Cowdery's absence."

Mr. Insull called attention to a statement made public by him early in January that he intended to take personal charge of the affairs of the company.

"Mr. Cowdery is going away because of illness," he said. "Mr. Munroe is not going to be made president in his place. Mr. Munroe is vice-president and will continue as such to take an active interest in the management."

Chicago Dealers Claim Prices of Materials Are Irregular

Chicago dealers in materials used in the gas and electrical industries describe prices as irregular, some marking declines but others continuing on the planes established during the war. Gas ranges are among the articles whose costs are less, though not down to what may be termed normal points. It is said that prices are lower, however, probably sufficiently so, to encourage large numbers of domestic buyers in the coming spring season.

Winsted Company Asks Permission to Increase Capital

The Winsted (Conn.) Gas Company has filed a petition in the office of the Secretary of State to the general assembly for permission to increase its capital from $300,000 to $500,000.

Bridgeton Company Makes Application for Higher Rate

Giving notice that the Bridgeton (N. J.) Gas Light Company had made application to the New Jersey Board of Public Utility Commissioners for permission to increase its rates, former Senator B. H. Minch, president of the company, appeared before City Council to offer a duplicate of the petition and give notice that a hearing had been set for Feb. 4. Mr. Minch made his statement and there was some discussion of the matter.

The Petition

There was brought out the following facts relative to the petition of the company to the Board of Public Utility Commissioners for an increase in the gas rate:

Present rate is $1.15 with a cash rebate of 2½ cents for gas sold through regular meters.

Proposed rate is $1.30 flat, to all consumers. It was originally proposed to make this rate effective Jan. 1, 1919, but the Board of Public Utility Commissioners could not set a date for a hearing before that time.

The directors of the company believe that the stockholders are entitled to a fair return on their investments. They have only been able to pay dividends by drawing upon the surplus account, and this method of paying dividends, manifestly, cannot continue. The increase to $1.15, effective in July last, gives only partial relief.

Increased Cost

With the petition are statements "A," covering the four months' period since the new rate went into effect, and "B," covering ten months, both ending Nov. 1, which show in detail the increase in cost of manufacturing in 1918 over the normal years of 1914-16 to be over thirty-five cents per 1,000 cu. ft.

During the above ten months' period, labor has been advanced three times, so that present day labor costs represent an increase in manufacturing costs over the average for period named, of between six and seven cents per 1,000 cu. ft.

The franchise tax for 1919 will add more than another cent to manufacturing costs.

Present Cost

The present cost of manufacturing, therefore, is about forty-four cents per 1,000 cu. ft. over the cost in normal years.

Manufacturing costs have been kept as low as possible; repair expenses are below normal and cannot so continue. The same is true of distribution expenses. Salaries of officers have not partaken of the general labor advances.

Labor costs need only be referred to in a general way. Everyone is familiar with such matters.

Coal

The company has many months' supply of coal in store and on contract, purchased at the high prices, both for the coal and for the freight, established by Governmental authority.

The company has not been able to renew their coal contract even at the high figures, because the miners of gas coal believe that a higher rate will become effective for that kind of coal.

A rate that would yield 8 per cent on the capital, used and useful, of this company would need to be $1.35 per 1,000 cu. ft., without providing for the losses in revenue already had in operating at the lower rates.

The rate being asked for, however, is only $1.30 per 1,000 cu. ft., and to which rate this company believes it is justly entitled.

The San Diego (Cal.) Consolidated Gas & Electric Company Employees' Association held the fifth annual meeting recently. The following officers were elected for 1919: President, W. H. Ellison; vice-president, W. A. Lambert; secretary-treasurer, R. B. Tallman; directors, J. A. Harritt, C. W. Wiggins, Otto Goldkamp, A. T. Peterson, H. W. Elder. Directors held over for 1919: E. W. Jones, J. E. Hayes, H. McConville, F. P. Kibler.

The New Britain (Conn.) Gas Company employees are planning the organization of a social club. It is expected a meeting will be held at an early date when officers will be elected.

The Leominster (Mass.) Electric Light & Power Company and the Leominster Gas Light Company employees have organized a club and in the near future are to have some elaborate rooms, and indications are that considerable will be heard from them in the social line. The former office of the company in Mechanic Street has been given over to the employees to be fitted up for the club rooms. According to the present plans a model clubroom will be equipped, and work has already been started upon it. These officers have been elected for the new organization: President, Ervin R. Hubbard; vice-president, Fred. F. Johnson; secretary and treasurer, Roy E. Maston; social committee, Fred F. Johnson, Arthur A. Dunn and T. W. Wedge; committee for rules and regulations, George A. Dufour, Arthur A. Dunn and Charles Sheehan.

The United Gas & Electric Corporation received as its proportion of the surplus earnings of subsidiary companies, for the 12 months ended Nov. 30, 1918, $708,276. Total income, etc., was $884,070. After charges of $751,386, there was a balance of come derived from bond investments, $132,684 available for dividends.

GAS
HOLDERS

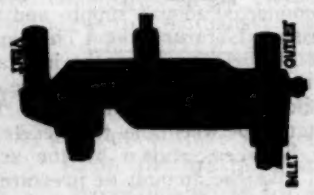
RITER-CONLEY
—CO.—

PITTSBURGH

COAL
GAS
PLANTS

GENERAL STEEL CONSTRUCTION

HIGH PRESSURE



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(With Mercury Seal)

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C. B. BABCOCK CO.
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REYNOLD'S
ARTIFICIAL GAS GOVERNORS
AND
NATURAL GAS REGULATORS
For All Kinds of Pressure Reduction
WRITE FOR CATALOG
REYNOLD'S GAS REGULATOR CO.

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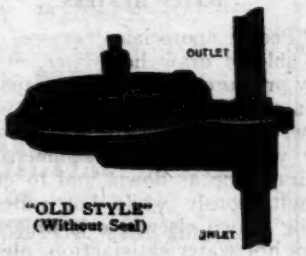
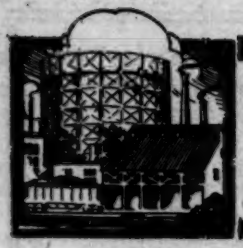
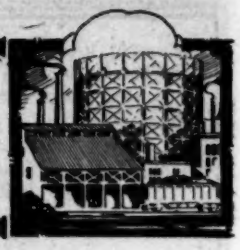


"OLD STYLE"
(Without Seal)

Main Office and Works
ANDERSON, INDIANA



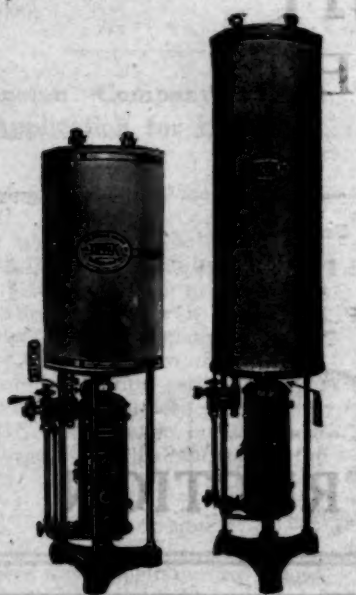
With The Equipment & Appliance Manufacturers



Conducted by Business Department of American Gas Engineering Journal

A Few Valuable Hints About Continuous Hot Water Supply for the Home

The Long - Landreth - Schneider Company, New Brunswick, N. J., manufacturers of "Kompak" automatic water heaters, have recently issued a circular, entitled "What Kompak Means to the Gas Companies." It gives the manager of the commercial department just the information he wants to know. We quote a few of the points specially emphasized.



NOS. 18 AND 32—KOMPAK AUTOMATIC WATER HEATERS

"People appreciate 'Service.' To be able to draw hot water, at full city pressure, at full faucet capacity, in a stream as big as the cold water flow, and to be able to get this service winter, same as summer, upstairs, same as down, and to get it simultaneously while hot water is being drawn elsewhere is what renders hot water satisfaction, pleases customers and makes orders easy to get."

"A Kompak when in use burns about ¾ of a ft. of gas per minute, with a possible peak load of 50 ft. of gas per hour. What does this mean? It means that you can place 8 Kompaks on your main with a combined peak load equal to that of one instantaneous water heater. They therefore solve your small main problem."

"Since the maximum gas consumption is only 50 ft. of gas per hour, the gas can be tapped from the nearest ½-in. gas line. You are familiar with the cost of running a separate service and can easily figure the saving when hundreds of installations come into consideration. The cost of running a separate service or the objection to tearing up the lawn, often stands in the way of a sale of an automatic water heater."

"A three-light meter will supply gas for the entire house including the water heater. This prevents capital being tied up in extra gas meters for automatic water heaters."

"A Kompak Automatic Water Heater with two ¾-in. water connections, ½-in. gas connection and 3 in. flue connections costs less to install than a tank heater. This means low cost to the owner with correspondingly bigger sales possibilities."

"They operate independent of water pressure. No matter how low the pressure, even tank in attic pressure, does not affect the service, with the result that they can be installed anywhere."

"When you consider that the Kompak is really only a tank heater and a boiler proposition you can get an idea of the maintenance expense required. The thermostat is the only automatic part about it, and this has been so perfected as to require practically no attention. The flue gases do not touch the tank and there is no condensation on coils, therefore there is no material depreciation to heater. Seasonable adjustments are not required since hot water is delivered at full city pressure winter as well as summer."

A Portable Pressure Gauge

A convenient pressure gauge of a portable type, which can be simply screwed to the piping wherever it is desired to take the pressure, is shown in the accompanying illustration.

16-IN. "U" GAUGE

This gauge is made in thirteen sizes ranging from 4 in. to 36 in. It consists of a "U"-shaped tube, which is made of one piece of glass tubing bent to shape in the sizes from 4 in. to 10 in., and in larger sizes of two straight glass tubes connected at the bottom by a metal band. Between the two sides or legs of this tube is set a scale graduated in inches and tenths or pounds and ounces as desired. A bent brass tube, or gooseneck, is connected to the "U" tube at the top and runs down the side to the gas connection A filling screw is provided for the water or mercury and a vent where the gooseneck is connected to the "U" tube to relieve the gas pressure on the inlet-side after shutting off the gas at the pipe.

When used the gauge is filled with water or mercury to the centre of the scale, which is zero. The gauge is connected to gas supply and the pressure is turned on. The liquid will fall below zero on the inlet side of the "U" tube and rise on the opposite side the same distance. The distance between the two levels of the liquid as shown by the scale will give the amount of pressure in inches and tenths or in pounds and ounces, according to the graduation.

This is one of the many styles of gauges manufactured by the American Meter Company of New York.

ESTABLISHED 1855

McDONALD METERS

NOTED FOR ACCURACY

Consumers' Meters, Regular and Prepayment. Station Meter Work of Every Description. Meters Repaired. Meter Provers. Correspondence Solicited.

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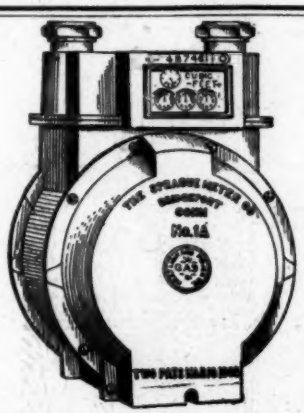

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Lessens Maintenance

With **Sprague Meters** it saves 65 per cent of the upkeep costs. Figure it on the years' installations —then write for proof.

SPRAGUE METER COMPANY
BRIDGEPORT, CONN.
Los Angeles, Cal., Davenport, Ia., San Francisco, Cal

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For Increased Capacity under Slow Speed Operation

ARTIFICIAL AND NATURAL GAS METERS, PREPAYMENT METERS, STATION METERS, METER PROVERS, COMPLAINT METERS, &c. SPECIAL ATTENTION TO REPAIR WORK

MARYLAND METER WORKS
OF
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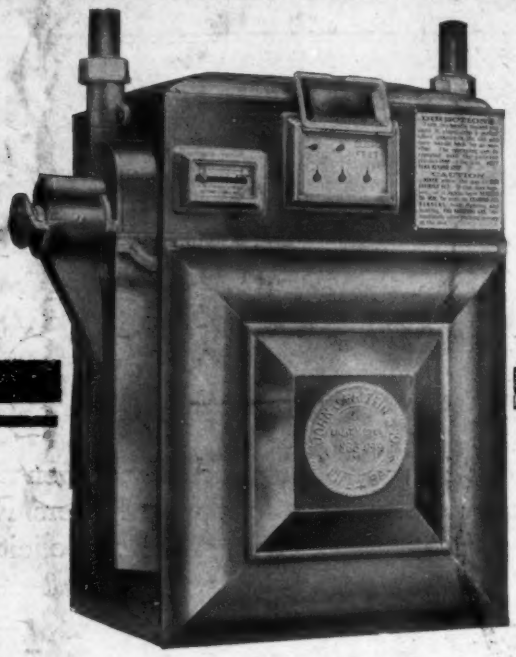
N. W. Representative—Northwest Gas & Electric Equipment Co., 412-415 Gasco Bldg., Portland, Ore.



GAS METERS

STATION METERS

GAS APPARATUS

PREPAYMENT METERS

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